SCIENTIFIC AMERICAN

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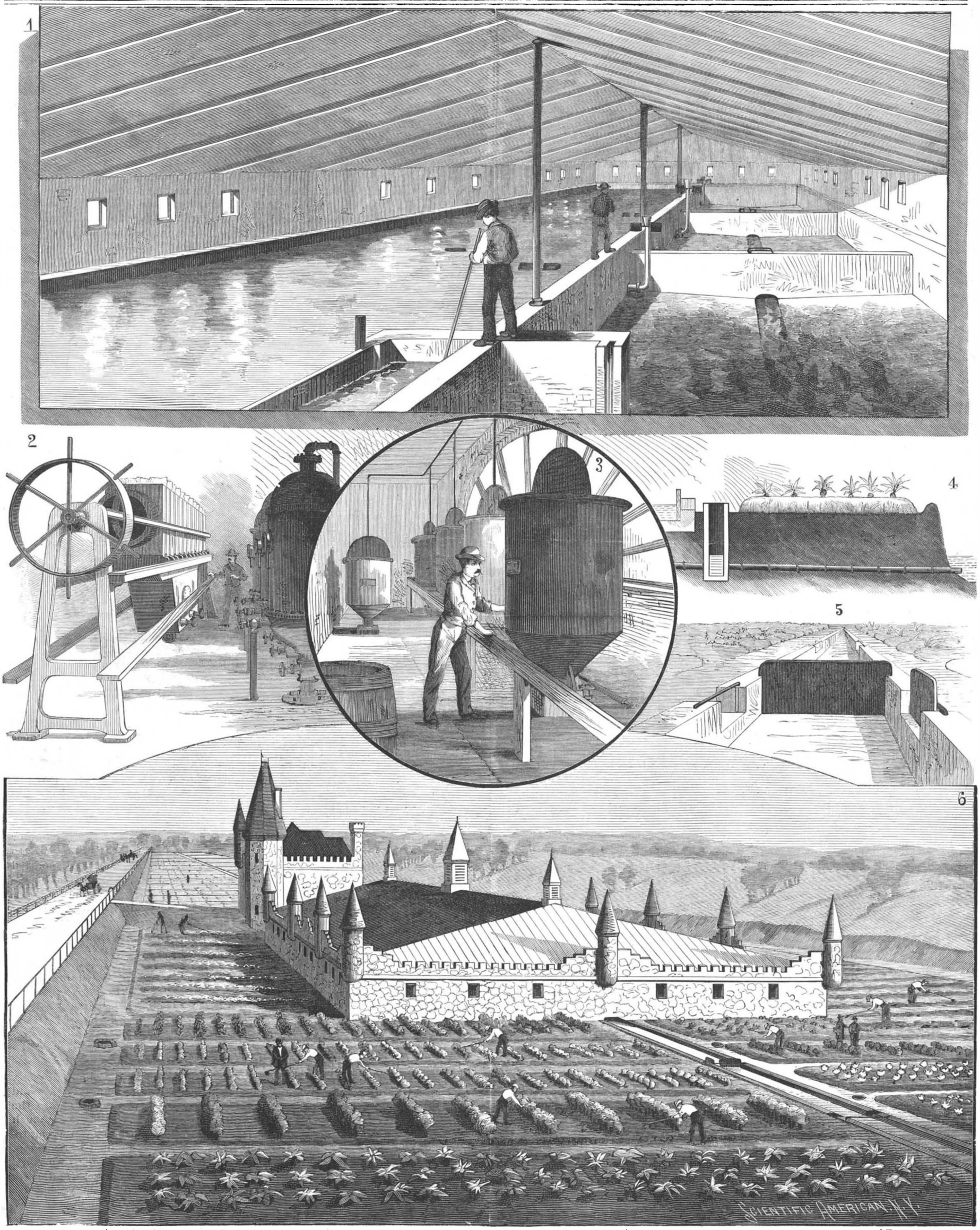

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MECHANICAL AND CHEMICAL SYSTEM OF SEWAGE DISPOSAL AS CONDUCTED AT EAST ORANGE, N. J.—[See page 307.]

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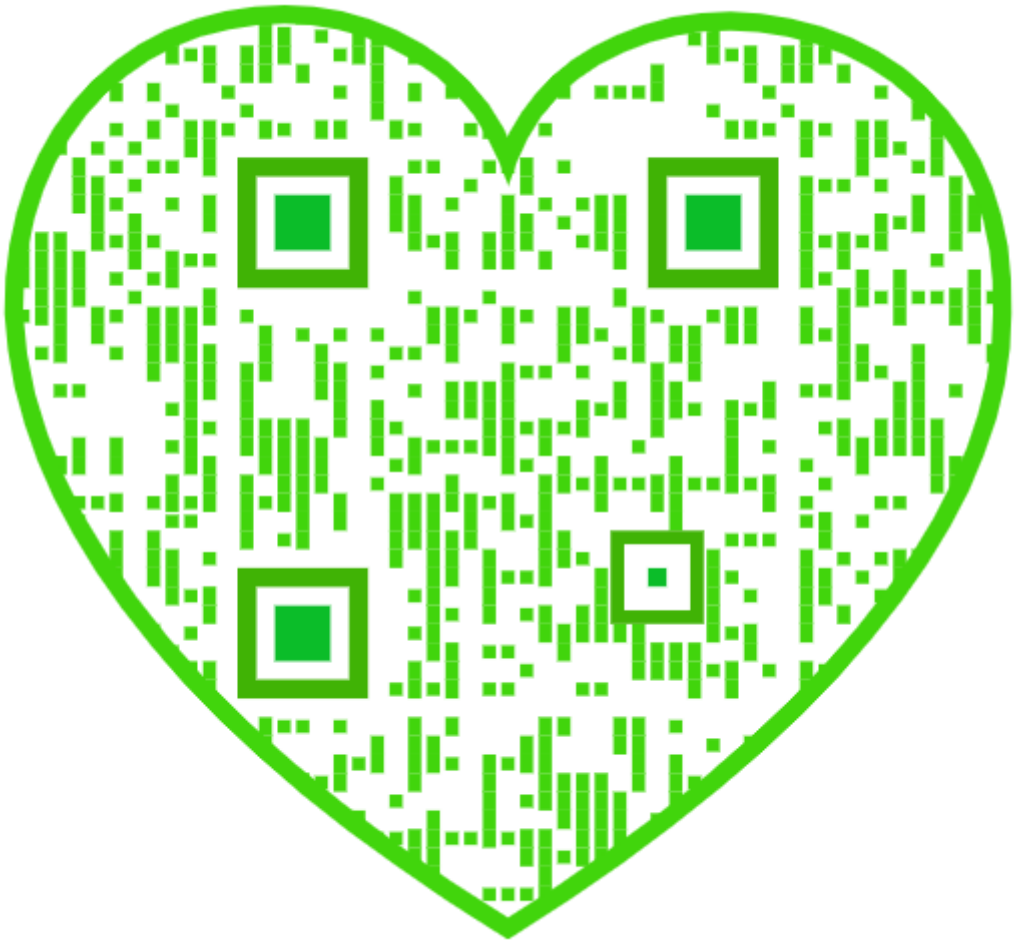

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THE PARIS EXPOSITION OF 1889.

The preparations for the great exhibition of the industries of all nations to be held next year at Paris are going on apace. The Eiffel tower has passed the 200 meter mark, and now exceeds in height the Washington monument. All the scraps and waste from its construction are being saved to be made into paper weights and similar memorials. Other buildings are completed or in process of erection. Applications for space are pouring in, and Great Britain has already requested an extension of room, a good indication of her interest in the affair. The United States Commission have issued a circular calling the attention of the public to the fact that the space allotted to this country is rapidly filling up. The Commissioners undertake to forward and return, free of freight, all articles sent for exhibition. The allotment of space is set for November 15, and shipments begin in January. Absolute impartiality is to be exercised in the distribution. The cost will be met out of the appropriation of $250,000 made by the U. S. government, to be expended under the direction of the Secretary of State to defray all expenses. All communications should be addressed to the Commissioner, General William B. Franklin, or Assistant Commissioner, General Somerville P. Tuck, Washington Building, No. 1 Broadway, New York. The French Commission will not correspond with exhibitors. All indications point in the direction of a great success, and it is to be hoped that America will occupy as honorable a station among the family of nations as she has hitherto held in such competitions.

THE FOOTBALL MALADY.

Tennis and baseball have each their especial form of ailment, or, rather, there is a particular affection which those who indulge too freely in these sports—too freely for their strength—are wont to complain of. Recently an English physician has discovered and formulated an ailment that is peculiar to those who play football. Not being familiar with the game himself, he does not offer any explanation of how the hurt is received, but any one who plays can make a fairly good guess at this. In "rushing," as well as in following or heading off, when the "backs" or "half-backs" come together, the front lines get the most shocks, those stepping highest in running usually getting the most harmless if not the lightest blow, for their high-poised knees act as fenders. But the blow given by this high-poised knee to the adversary is on the front and outside of the thigh. Often a player, after a severe "rush," feels faint and helpless without being able to assign any cause, with perhaps neither pain from nor recollection of a blow. He soon pulls himself together, and goes on with the game. Next day, though still without pain, he cannot run, and finds himself limping. Dr. Werry, of England, writing on the subject, says: "On examination, there may be effusion into the knee joint, a soft and somewhat tender area over the quadriceps extensor femoris, and the patient cannot lift the limb when it is kept extended. Ecchymosis is not common. The amount of knee joint effusion depends on the position of the injury with regard to the bursa behind the quadriceps tendon, and whether the man has tried to continue his sport or walked much after the accident. The blow may be in the middle of the thigh and cause an effusion into the joint; the player may complain of a swollen knee, forgetting the real malady. Usually the muscle is found to be more bruised than broken."

"MOSQUITO DEFENSE."

Those who have pinned their faith to big ships, big guns, and heavy armor have had cause, more particularly of late, to doubt the efficacy of the system they espouse. For several years the naval party in England that bent its efforts to furnish Britain with the Thunderer and Benbow type of sea-going monsters has been losing ground; the chief naval constructor employed in carrying out their plans was removed, the size of new ships lessened, the speed increased, till now—since the recent naval maneuvers—the revulsion of feeling is so strong that the entire system of war-ship construction is likely to undergo a change. In the face of the attempts made during the recent British naval maneuvers to weaken the torpedo boat attack from the shore, its efficacy appeared so clearly, the vulnerability of the big ships was so evident, that no further attempts at concealment will avail, and the highest authorities are admitting the necessity for torpedo boats in harbor defense. One military journal declares that half a dozen torpedo boats would avail far more in offshore work than the big belted ship which costs as much as a dozen of them. Another says that Admirals Rowley and Baird could not blockade a hostile fleet in a British port, though heavier than it, because of the torpedo boat annoyance. The enemy, knowing the time he would try to escape, could husband his coals, in some cases not even keeping his fires banked, while outside it was necessary to keep steam up against sudden attempts to run the blockade and to avoid the continual machinations of the torpedo boats.

There are others, some of them well known for their knowledge of naval warfare, who have gone even further; one portion of them taking the ground that a torpedo fleet, for shore defense, would prove as effective as a line of battle ships, thus permitting the dispatch of the big boats to the channel and other uncovered points, while the other portion openly declare that a torpedo fleet should be constructed and maintained for harbor defense because it is likely to be more effective, to say nothing of cheapness, than great armor clads could be.

In a recent paper by Sir George Baden-Powell, M.P., on "Mosquito Defense," he points out, though tardily it must be said, the necessity for a torpedo fleet, and shows how valuable an aid the steam yacht fleet could be made in protecting the coasts from a hostile fleet. In this country we long since discovered this, and, indeed, an attempt was once made to get authority for enrolling them in a naval reserve. The author describes, as others have done, the awkwardness of the big ships, how slow they were in turning, the enormous appetites they had for coals, their liability, not only to exhaust the supplies in the bunkers, but to exhaust them suddenly.

He noticed, as others did, the ease the quick-heeled torpedo boats approached and maneuvered about these Titanic monsters when the night was dark or the weather thick; circling them, dodging in between them, and he might have declared, and reasonably too, that the mere fact they were thus able to approach, though, because engaged in peaceful maneuvering, not permitted to strike, was good circumstantial evidence of their effectiveness. For it is admitted that advancing torpedo boats can be protected from the fire of machine guns, and, of course, nothing heavier can be handled quickly enough for use against them.

For us, now engaged in building a navy, these lessons are invaluable. So far we have a new fleet of slow ships that can neither fight nor run away. All naval authorities are agreed that the only types of big ships that can be made effective in war are the ponderous floating battery, slow but heavily armored and armed, and that which can steam at least 18 knots an hour—even then she cannot catch the fast merchant steamers. In our new fleet we have not a ship that can do better than 16 knots, and, strange to say, these slow ships are not heavily armored, so as to be able to stand the shock of battle with ships of other navies which could overhaul them on the high seas. Add to this that they are not heavy enough for harbor defense, and one may reasonably inquire what purpose they were intended to serve. If only for showing the flag in foreign parts, surely less costly boats, with wooden sides painted to represent steel, and pierced for Quaker guns, would have done quite as well.

Situated as we are, the necessity for an effective mosquito fleet seems more urgent than for a fleet of big ships, but if we are to have big ships, let us have fast ones.

Peruvian Whistling Jugs.

The silvadors or musical jugs found among the burial places of Peru are most ingenious specimens of handiwork. A silvio in the William S. Vaux collection at Philadelphia consists of two vases, whose bodies are joined one to the other, with a hole or opening between them. The neck of one of these vases is closed, with the exception of a small opening in which a clay pipe is inserted leading to the body of the whistle. When a liquid is poured into the open-necked vase, the air is compressed into the other, and in escaping through the narrow opening is forced into the whistle, the vibrations producing sounds. Many of these sounds represent the notes of birds; one in the Clay collection of Philadelphia, Pa., imitates the notes of the robin or some other member of the thrush tribe peculiar to Peru. The closed neck of this double vase is modeled into a representation of a bird's head, which is thrush-like in character. Another water vase in the same collection, representing a llama, imitates the disgusting habit which this animal possesses of ejecting its saliva when enraged. The hissing sound which accompanies this action is admirably imitated. A black tube of earthenware ornamented with a grotesque head in low relief, to which short arms are attached pressing a three-tubed syrinx to its lips, deserves special mention, as it suggests the evolution of this instrument from a single tube to more complicated forms.—*The Clay Worker.*

People Fret too Much about Trifles.

Women find a sea of trouble in their housekeeping. Some one says they often put as much worry and anxiety into a loaf of bread, a pie, a cake, into the weekly washing and ironing as should suffice for much weightier matters. Suppose these things go wrong to-day, the to-morrows are coming in which to try again, and the thing is not worth clouding your own spirit and those around you, injuring yourself and them physically—for the mind affects the body—and for such a trifle. When a thing is beyond repair, waste no useless regrets over it and do no idle fretting. Strive for that serenity of spirit that will enable you to make the best of all things. That means contentment in its best sense.

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The Feet of Animals.

JOHN R. CORYELL.

The adaptation of means to an end is nowhere more beautifully illustrated than in the conformation of the feet of various animals. If this difference of conformation were limited to difference of class or order, the wonder would not be so great. It is not at all strange that the foot of the camel and that of the horse should differ, but there is something striking in the fact that the feet of members of the same genera should differ. This shows the readiness of nature to adaptation, or, in more scientific and exact language, proves the power of the circumstances of the creature's environment. Just as any competent naturalist can from the back tooth of an animal, before unknown to him, tell the story of that animal's life, habits, and nature, so the same naturalist could tell the same story by a study of any animal's foot.

Take the hare for an example. The foot of the common hare will, on examination, show mainly the ability of the creature to make great leaps and to make an equally quick recovery. The external condition of the foot indicates nothing peculiar in the habits of the animal. It is distinctly divided between the toes, and is covered moderately with hair. Now examine the foot of the Carolina hare. At the first glance it is not different from its cousin's foot; but a closer scrutiny discovers a partial web between the toes, and a lesser quantity of hair on the whole foot. These characteristics point infallibly to the fact that the hare is at home in either marshy places or in water, or in both. And so in fact the Carolina hare is, taking to the swamps and to the pools in the swamps as readily as a water bird. Look now at the foot of the Arctic hare, and there will be found a very different sort of modification. This hare must travel over the yielding or, as frequently, slippery snow, and it needs a foot which will at once offer the greatest surface and the most resistance to slipping. These requirements are met by a greater expansion of the membranes of the toes and mainly by a very heavy growth of hair on the foot between the toes. The foot of the Arctic hare is even more a snowshoe than the foot of the aquatic hare is a paddle.

This same modification is found in the feet of dogs. The Eskimo dog has the snowshoe foot, the water dog the paddle foot, while the greyhound, for example, has a foot formed on the model best adapted to speed, that is to say, it is small, light, and hard, But this modification of a foot to suit land, water, or snow is too common an occurrence to cause the surprise it otherwise would, although there happens now and then a failure to adapt which serves to emphasize the fact—as in the case of the deer, which, instead of being so modified that it can bear itself up as if on snowshoes, is obliged to let skill step in where modification fails to come. When the snow is soft it sinks helplessly in and flounders about as clumsily as any other animal less used to the feathery material; but when there is a crust on the snow, as there generally is in the northern regions, even though that crust would sink under the same weight of horse flesh, the deer knows how to glide over it in safety. How much of an art this is can be best appreciated by watching how the light-footed cat will come to grief on the glistening surface of crusted snow. In spite of its sharp claws it will slip this way and that, and finally break through, where five times the weight of reindeer or moose flesh would have skimmed along with ease, speed, and safety.

It is needless to say that the cat has never adapted itself to either snow or water. And yet the foot of the cat has been modified from its most perfect form, as found in the lion and tiger, where the formation is so beautifully fitted to leaping and alighting. In the latter particular, the adjustment of the muscles and bones to a minimum of shock is marvelous. The man who jumps down but a few feet and, despite his utmost efforts to save himself, nevertheless jars his whole frame, can best marvel at the ease with which the members of the cat family alight from great heights. Even the ponderous body of the lion or tiger makes hardly more noise than a rubber ball coming to the ground. From the lion to the cheetah, the foot is essentially the same, but it is nevertheless modified in minor particulars to suit the differing conditions of the various members of the great family.

It is among the birds, however, that the greatest variations in feet are to be found. At first sight some of the variations seem arbitrary, but a little study soon shows that in this, as in all respects where nature holds sway, everything is logical. For example, we have the water ousel, a member of the thrush family and yet a water bird. It might fairly be expected to have webbed feet, but it has not. Its young take to water even more readily than young ducks, and it delights in the most turbulent streams, as if its passion for the water could only be appeased by indulgence in it under its roughest form. It has been known to build its nest behind a waterfall, darting through the falling water with as little concern as if it were only mist; and the nest itself is placed where it is constantly being sprayed upon and where the first sound the little ones will hear is the music of its fall. And yet this bird has not the webbed foot of the true water bird. And why? Because it has no use for its feet in swimming the short distance it does. Its wings are equal to all emergencies, and hence its feet have never become modified.

The webbed foot is spoken of as characteristic of the true water bird, and so it is; but there are nevertheless many birds whose whole lives are passed on or in the water whose feet are not webbed—as the grebe, which for swiftness of motion and celerity in diving is not surpassed by any bird. It has only a partially webbed foot, each toe being provided with a fringe of membrane which answers to the purpose of a full web when in the water without being as much of an incumbrance when the bird is on land.

Then too some of the wading birds are provided with webbed feet while others are not. In most cases it will be found that the webbed foot is present only where the use for it is obvious, as where the habitat of the bird is in the swamps. Where it is found in the true wading birds, it is for the most part a relic of a previous state. Where the bird frequents water instead of ooze, there is no need of a web, and it is very seldom present.

One of the most striking modifications of a bird foot is found in the little Chinese jacana, which is a water bird in its haunts and habits and yet is not so in appearance. Its food is found for the most part on the leaves of the aquatic weeds which rise above the surface of the water, and consists of the tiny insect life always so abundant there. Many of these aquatic plants, notably the lily, cover the surface of the water with a rank but unstable growth. No one or two of the leaves would afford a sufficient resting place for even a bird; but distribute the weight of a small bird over several of the leaves, and it could wander over the undulating surface with perfect safety. The toes of the jacana are so disproportionately elongated that the desired condition is attained, and it can pass securely over a carpet of floating weeds where a lighter bird, lacking the elongated toes, would sink at once into the water. The jacana endures the water well enough, but it is on the surface and not in the water that it finds its food. When alarmed, it dives at once into the water and swims some distance before coming up. And even then it does not come fairly to the surface, but merely thrusts its long bill out of water until the nostrils are exposed, and so hidden it remains until danger is past.

Even among the web-footed swimming birds there are notable modifications, not so much in the foot itself, as in the position of it. Those birds which confine themselves to the surface of the water are usually fair walkers on land and are among the best fliers in the bird world, while those birds which are divers and swimmers under water are, generally, poor fliers and still worse walkers. The difference in the powers of flying is due mainly to the fact that the ability to swim under water relieves the bird from the necessity of taking to the air, either for safety or for progress; but the difference in walking is the direct result of that modification which makes the bird a good diver and sub-aquatic swimmer, and the better the diver, the poorer the walker, the one quality following so closely on the heels of the other that it is safe to say the best diver is hardly able to walk at all. This is because the feet in the divers are put so far back on the body. A familiar instance of the working of this rule is seen in our common geese and ducks. The latter, with their feet nearer the tail than the former, are much clumsier than they. And in some cases, as with the auk and penguin, the feet are placed so far back that the bird is forced to stand erect in order to progress at all in walking, and even then it does so with extreme difficulty.

A Soap Bubble Diffusiometer.

At the recent *soiree* of the Royal Society, the principal feature of the evening was the soap bubble experiments of Mr. C. V. Boys. One of these afforded a beautiful illustration of the phenomenon of the diffusion of gases. A spherical bubble was blown on to a fixed ring of wire, and within it a smaller free spherical bubble was blown of a mixture of gas and air. This bubble rose and floated near the top of the inclosing bubble, but without coalescing with it, owing to the presence of the intervening layer of air, which prevented actual contact between the two soap films. The whole was then inclosed under a bell glass, to which a current of coal gas was admitted. In a few seconds the inner bubble left the upper part of the larger bubble, and after floating about in it for a short time, descended, and finally rested on the bottom; thus showing that diffusion had taken place through the films, and that the specific gravity of the contents of the bubbles was consequently equalized. This proof of the reality of the diffusion of gases through such a medium as a soap film, which remains intact the while, is a very striking one; and it can be modified in a variety of ways. Thus a soap bubble was blown with pure oxygen gas, and immersed for a few seconds in a bell glass containing the invisible vapor of ether. When the bubble was withdrawn and approached to a flame, it exploded with a flame and report, showing that during the short time of its exposnre to the ether vapor, diffusion had occurred, and the original filling of pure oxygen had given place to an explosive mixture of oxygen with the ether.—*The Journal of Gas Lighting.*

PHOTOGRAPHIC NOTES.

To Impart a Beautiful Brown Tone to Platinotypes.—According to a communication of M. Taeschler-Signer, in the *Rundschau*, a beautiful brown tone may be imparted to platinotypes, if to a hot solution of potassium oxalate a solution of bichloride of mercury is added before development.

Solution A.

Potassium oxalate	295 grammes.
Water	1,000 c. c.

Solution B.

Bichloride of mercury	5 grammes.
Water	100 c. c.

Solution A is warmed up to 158° to 176° F., then solution B is added. According as more or less bichloride of mercury is added, the tone may be altered from the common grayish blue to brown, even to sepia color. This method may be a good one for those who prefer the brown tone to the dull engraving color of platinotypes, but to my mind the permanence of the pictures will run risk by adding mercury bichloride. It is well known to photographic operators that negatives having been intensified by means of bichloride of mercury and ammonia, after continued exposure to light, after about eight days, commence to bleach if looked at by reflected light.

Excellent Toning Bath for Albumen Prints.—The following is recommended by James Bourier, in the *Amateur Photographer:*

Distilled water	1,200 c. c.
Carbonate of soda	5 grammes.
Benzoic acid	10 "
Gold chloride (brown)	1 gramme.

No other gold bath has given to the author such beautiful, warm, velvet-like tones as the above, which has also the advantage to keep very long. The natural benzoic acid, produced of gum benzoin, is, however, rather dear, while benzoic acid "extoluol" (a compound of the coal tar oil) is much cheaper, and as good as the natural one. The benzoic acid being lighter than water, floats upon the latter, and the bottle in which the gold bath is made must, therefore, often be shaken, to cause the crystals to dissolve.—*H. Gunther, in Photographic News.*

Lacquer for Iron and Steel.

A new preservative of iron and steel has been found in a modification of the well known Japanese gum lacquer. After many experiments, the preparation has been finally adopted for the imperial Japanese navy. There is a certain difference between the compound prepared for painting iron and steel and the ordinary lacquer employed for wood, but its principal element is still the gum lacquer. The inventor of the new composition had great difficulty in conquering the tendency of this material to get very hard and then to crack, but, according to the reports, he has succeeded at last. Experience has shown that a ship protected with this variety of lacquer has been able to keep afloat in tropical seas for three years—going into dry dock only once instead of six times during that time, as usual. A ship of the Russian Pacific squadron has tried the new coating, and the result has been very satisfactory. It is consequently thought that at last a tolerably perfect anti-corrosive coating for iron and steel structures has been discovered, which may render substantial service in the preservation of all descriptions of erections in these materials. The first cost of the preparation is rather high, but it is claimed that the excess of cost is more than compensated by the protection obtained. For ship use it is also asserted that great advantage accrues from the high polish which this lacquer retains while the coating remains perfect, but, on the other hand, fears are expressed that the supply of gum lacquer will be unequal to the demand, if the requirements for these engineering purposes are added to the regular consumption of the article for ornamental joinery and cabinet work.

Coloration of Flame by Elements.

Herr Cracau points out as a point probably worthy of further investigation (*Der Pharmaceut*, Sept. 15, p. 116) that certain elements resembling each other in chemical properties impart colors to flame that are complementary. For instance, potassium and sodium resemble one another in chemical properties, and the former imparts to flame a violet and the latter a yellow color, the two colors being complementary; barium and strontium also resemble each other chemically, and the one colors flame green and the other red; and a similar remark applies to zinc and cadmium. Herr Cracau also thinks it suggestive that the colorations produced by potassium and calcium, both of which lie under suspicion as to their true elementary character, are of a compound character, the one being violet, a combination of blue and red, and the other orange, a combination of red and yellow.

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AN IMPROVED GATE.

A vertically swinging gate, which can be readily raised and lowered from a convenient point on the roadway at either side, is illustrated herewith, and has been patented by Mr. Alphonso H. Broad. The top bar of the gate is pivoted in a double post at one side of the roadway, and has a weighted extension about heavy enough to balance the main portion of the gate, the horizontal bars of which are suspended by means of

BROAD'S VERTICALLY SWINGING GATE.

pivoted hangers. A toothed segmental bar is secured to the top bar of the gate, concentrically with its pivotal point, and meshing with a toothed wheel mounted in bearings at the top of the post, the shaft of the toothed wheel being extended by a jointed section to any suitable point at the side of the road, where it is provided with a crank handle and has bearings on a post. By this construction the shaft may be extended out of a straight line, or up or down hill, the gate being so balanced as to be readily raised and lowered by means of the crank handle. In order that the top bar shall not bind in the post in which it is pivoted, it is provided with a friction roller mounted in a slot adjacent to the post.

For further information relative to this invention address the inventor, or Mr. Roldin S. Robbins, Berkeley, Cal.

Dangers of the Boiling Springs.

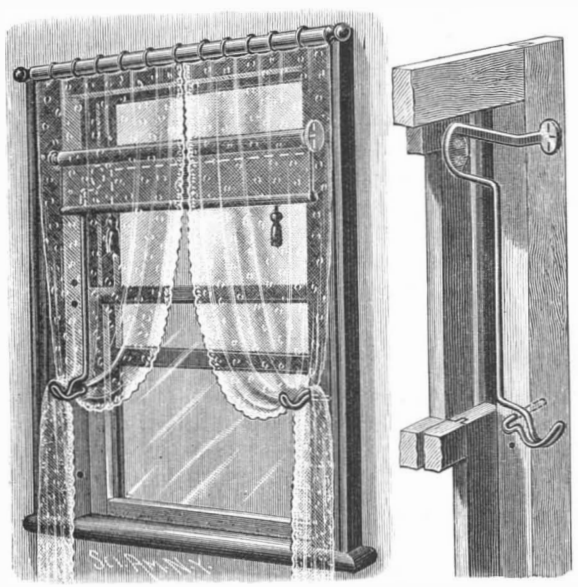
The St. Louis *Globe Democrat* says a telegraph operator by the name of Samuel C. Pratt, employed as night operator for the Southern Pacific Railroad Company at Hot Springs, Nev., while bathing recently in one of the cooler springs, accidentally fell into one which remains at the boiling point, and, although he climbed out without assistance, became unconscious immediately after. He was taken to Wadsworth, where he died. He was standing on the crust forming the brink of the spring when it gave way, precipitating him into the boiling water. His flesh was literally cooked, and his finger nails came off. Mr. Pratt was a member of the famous Pratt family in Utah. His parents reside near Ogden.

IMPROVED CURTAIN BRACKET AND SASH LOCK.

A device to be attached to the upper sash of a window for supporting a curtain roller, and at the same time designed to serve as a sash holder, lifter, and fastener, is illustrated herewith, and has been patented by Mr. Samuel H. Scott, of Chanute, Kansas. It is made with a bracket arm extended at right angles from a plate secured by screws to the upper sash, the outer end of the arm terminating in a disk suitable for attachment to the ordinary supporting plate of a curtain roller. From the attaching plate also extends a rod with a bent portion reaching downward against the lower sash, its lower portion being bent outerly to form hooks for the flowing curtains, and its end made with an angular projection adapted to engage any one of a series of holes in the inside of the casing.

By this means the curtain roller and its attachment may be secured in place without marring the casing, and the curtain lowered with the upper sash, which can be conveniently supported at any desired height.

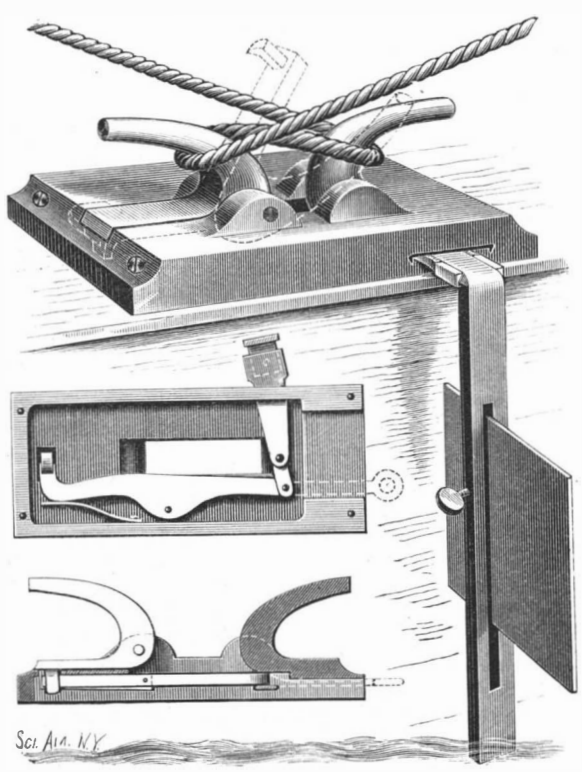
The device is substantially duplicated for each side of the window.



SCOTT'S CURTAIN BRACKET AND SASH LOCK.

AN IMPROVED CLEAT FOR VESSELS.

A cleat for holding the main sheet or other rope on the side of a vessel, and so constructed that, when the vessel keels over beyond a predetermined line, the rope secured upon the cleat will be automatically released by the action of the water, is illustrated herewith, and has been patented by Mr. John W. Foran, of St. Johns, Newfoundland. The base of the cleat has on its upper face one fixed outwardly extending horn or arm, with a central slot extending oppositely from the base of this fixed arm. In aligning ears at the sides of the central slot is pivoted an angular arm, the upper member of which curves outward in a similar manner to the fixed arm, while the bottom member normally rests upon the recessed surface, and has at its rear extremity a downwardly projecting lug having a latch head. Upon the under side of the base, as shown in the bottom plan view in the small figure, is pivoted a springheld lever adapted to engage the latch head, the other end of the lever being connected by a link with a second lever projecting through a slot in the side of the base. If the device is to be tripped automatically, an angular arm is connected to this lever to project downward over the side of the vessel, the arm having a longitudinal slot adapted to receive a plate to be secured by means of a set screw, the slot being made sufficiently long to admit of vertical adjustment of the plate. If it is desired that the boat should keel over on its side a certain distance only, the plate is fixed at a corresponding height, to come in contact with the water at the desired time as the vessel moves ahead, whereby the lever projecting from the base of the cleat is actu-



FORAN'S CLEAT FOR VESSELS.

ated, and the headed lug of the pivoted arm is released, permitting the arm to assume the position shown in dotted lines, and releasing the rope coiled upon the cleat. When the device is to be tripped by the boatman from the helm or other point, a rope is attached to the projecting lever to lead to the desired location.

Puget Sound Salmon Fishing.

This important industry is annually gaining in volume. The catch this year, although not as large as expected on account of the delayed fall rains, will be about 15,000 cases, four dozen cans per case.

There are five factories engaged in the business. The largest has a capacity for canning twenty thousand pounds of fish per day and employs six seines, costing, with the necessary skiffs and scows, $1,500 each, manned by Indian crews. The packing is done by Chinese, of whom one hundred and fifty are employed at one dollar per day, per head, boarding themselves.

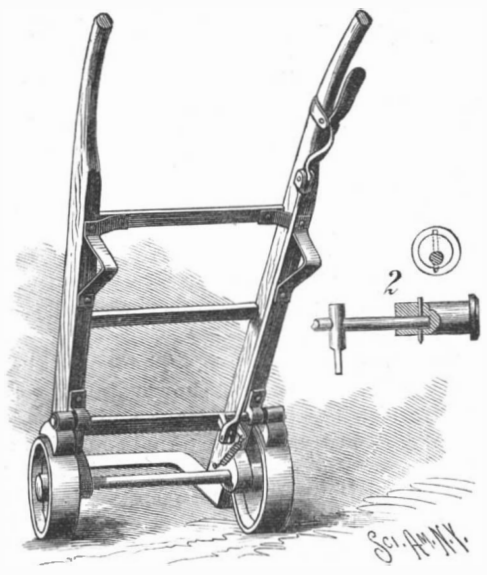
The cost of the fish is ten dollars per one hundred—ten cents each. The average weight is six pounds. Single specimens are frequently caught exceeding twenty pounds, but the smaller sizes are more palatable and more in demand for home consumption.

They are caught in the bays and harbors of the Sound. After running up into the fresh water streams to spawn, the fish soon lose their flavor.

Trolling for the fish is exciting sport, and much indulged in. They are gamey, and fight to the end, but are not as tenacious of life as the bluefish of the Atlantic coast, and are more easily exhausted.

AN IMPROVED HAND TRUCK.

A hand truck designed for use on wharves, in warehouses, or any place where freights are handled on inclines, is illustrated herewith, and has been patented

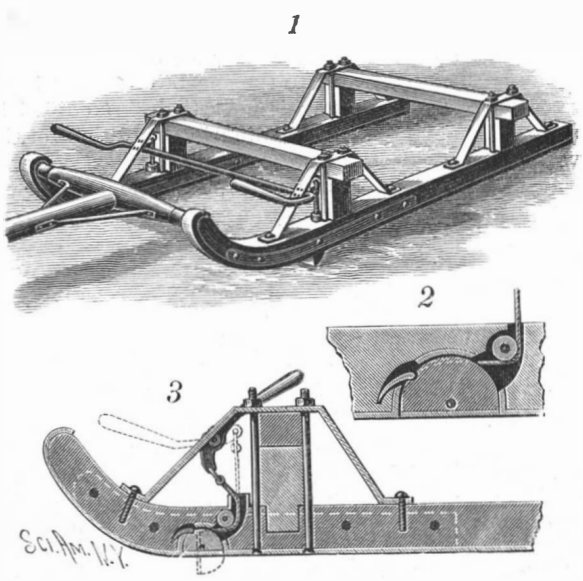


PARKER'S HAND TRUCK.

by Capt. John G. Parker, of Tacoma, Washington Territory. The invention provides a novel and simple manner of applying a brake to one or both wheels of the truck, while both hands of the operator are applied to the handles. The truck has the usual axle, wheels, and side frames, and there is a rock shaft supported in suitable bearings on the under side of the side frames, upon the projecting ends of which a cylindrical rod is eccentrically attached, these eccentrics, as shown in Fig. 2, loosely holding brake shoes for application to the wheels. Near one of the side frames a post is keyed or otherwise secured on the rock shaft, to which a brake rod is pivoted, extending up nearly to one handle, where it is pivotally united to one member of an angle lever fulcrumed on the under side of the handle. One end of a coiled spring is attached to the brake rod at the point where it is connected to the rock shaft, the other end being fastened to the inside of the truck arm; above the axle, this spring normally pulling the brake off. The application of the brake is made by means of the lever fulcrumed on the under side of the handle, as the handle is grasped, the brake being instantly applied and as quickly taken off when the lever is released.

AN IMPROVED SLED BRAKE.

A brake designed for use with any kind of a sled or sleigh is illustrated herewith, and has been patented by Mr. Anders Anderson, of Blossburg, Montana Ter. The forward part of the runners have each a semicircular recess, with a curved metallic lining, as shown in the sectional views, Figs. 2 and 3, and within the recess is pivoted a brake of corresponding shape, shod with a strip of metal, which lies in the same plane as the shoe of the runner when the brake is not in use. The brake is preferably operated by means of a cord or strap secured at one end to the forward part of its curved portion, and extending through a groove out at its rear, through an upper passageway, where it is connected to the arm of a shaft having lever handles pivoted in the frame of the sled. The brake has a spring catch to keep it closed while being backed. The circular form of the brake allows it to readily yield to any obstruction, and it may also be used as a stop in going up a hill, the cord or strap holding it in position. In the sectional view, Fig. 3, the dotted lines show the brake as applied, with the lever pushed forward, the normal position being shown in full lines.



ANDERSON'S SLED BRAKE.

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THE EAST ORANGE SEWAGE SYSTEM AND WATER WORKS.

The township of East Orange may be accepted as a representative surburban community. It is to a great extent inhabited by those who are in business in New York. It is rapidly increasing in population, and the problem of sewage disposal, as well as of water supply, has assumed, of late years, considerable importance. It is situated near the opening of the Orange Valley, a region whose drainage offers peculiar difficulties owing to its remoteness from tide water. Improved water works have recently been constructed, and as the need for drainage was thereby increased, an improved system of sewerage was introduced.

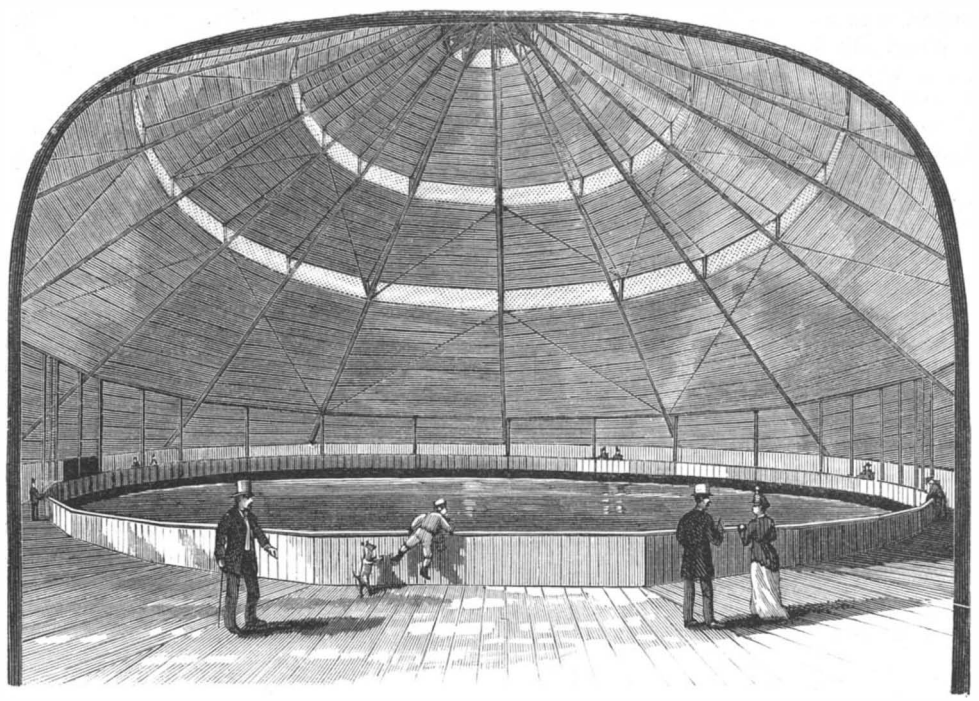
In August, 1886, the plans for the sewerage system were practically completed. They had been designed by Mr. Carrol Pb. Bassett, who had just made a special study of the subject in Europe, with whom was associated the eminent sanitary engineer Mr. Rudolph Hering. The works comprise a pipe system and disposal works. Contractors originally undertook the work, but abandoned it, and it was completed by the city, with Mr. Bassett acting as manager and engineer. The disposal station, which is the most original and interesting portion of the works, was designed entirely by him and was constructed under his supervision.

The lines of the sewer are laid in vitrified pipe, forming a complete pipe system. They vary in diameter from 8″ to 24″, and comprise, with their connections, some 25 miles of conduit. The grades vary from 1 in 800 to 1 in 30, according to inequalities of the ground. In some cases rock cuttings had to be made 22 feet deep; in other cases tunneling was resorted to, the depth in places being 31 feet. The ground, for the most part, lies in a series of parallel ridges, making the determination of most of the lines a comparatively easy one.

To the south, however, is a low region which had to be tapped by a special line which was carried thence to the disposal works as a transit sewer. Where the pipes were very deep, vertical shafts were carried up to receive the house connections, or an overlying secondary main was carried near the surface, communicating by shafts with the pipe below it. Every kind of difficulty from quicksand and other obstructions was encountered in the progress of the work.

The sewage collected by the pipe system is conveyed to the disposal works, illustrated on the first page. They comprise a dual system of sewage disposal by chemical treatment combined with intermittent soil filtration. Works are established on a low piece of ground, along one of whose margins is a brook which ultimately runs into the Passaic River. The sewage is received at the side of the main building. Within the main building are tanks, in which the chemicals are prepared. These are essentially milk of lime and sulphate of aluminum. Mixing with the sewage, the familiar reaction takes place between them, by which alumina is precipitated, carrying down with it all solid matter. The two mixtures are delivered to the stream of sewage as it comes to the works. It then runs through a square brick main to the tanks. This main is about 100 feet long, and is broken up continually by partitions running part way across, so as to resemble a fish ladder, by which name it is colloquially known. The object of the partitions is to break up the stream of sewage and mix the chemicals thoroughly with it. After running through this conduit it enters the tanks. Of these there are two, divided by low walls into separate compartments. The sewage is first received in two small square compartments, which are in free communication with the main tanks, except that a wooden sliding gate is provided between each of them and the main tanks, which floats upward as the water rises, so as to keep back the surface water, whereby bottle corks and all floating matters are kept within this division, to be removed from time to time. Under the gate the liquid flows, beginning at once to precipitate, and as it reaches the large tanks, where the current is, of course, slower, it precipitates still more. Two low walls run across each tank.

The sewage runs over the tops of these, from compartment to compartment, so that a progressive precipitation of the solid matter takes place in the three divisions. When it reaches the third it is perfectly clear, and thence it is allowed to run out to the filtration beds. Through the entire length of the three tanks and under the cross walls an open drain is carried, called the sludge channel, in which the precipitate settles. The semi-liquid mass is pumped thence into vacuum pans in order to avoid any contact between it and the pumps, and when the pans are full, the mass is forced by pneumatic pressure into multiple filter presses of the standard type, now extensively used in chemical works. Here it is filtered through canvas, the clear water passes out, and the chemically precipitated matter remains behind and is collected as cakes of a general disk shape and quite hard. As yet no analyses have been made of this material to determine its value from the agricultural point of view. It is proposed to sell or use it as it accumulates, for a fertilizer. Its value will undoubtedly be quite high, though the small quantity collected will preclude any large aggregate return from its sale. The liquid matter from the presses is run off with the rest to the irrigation farm.



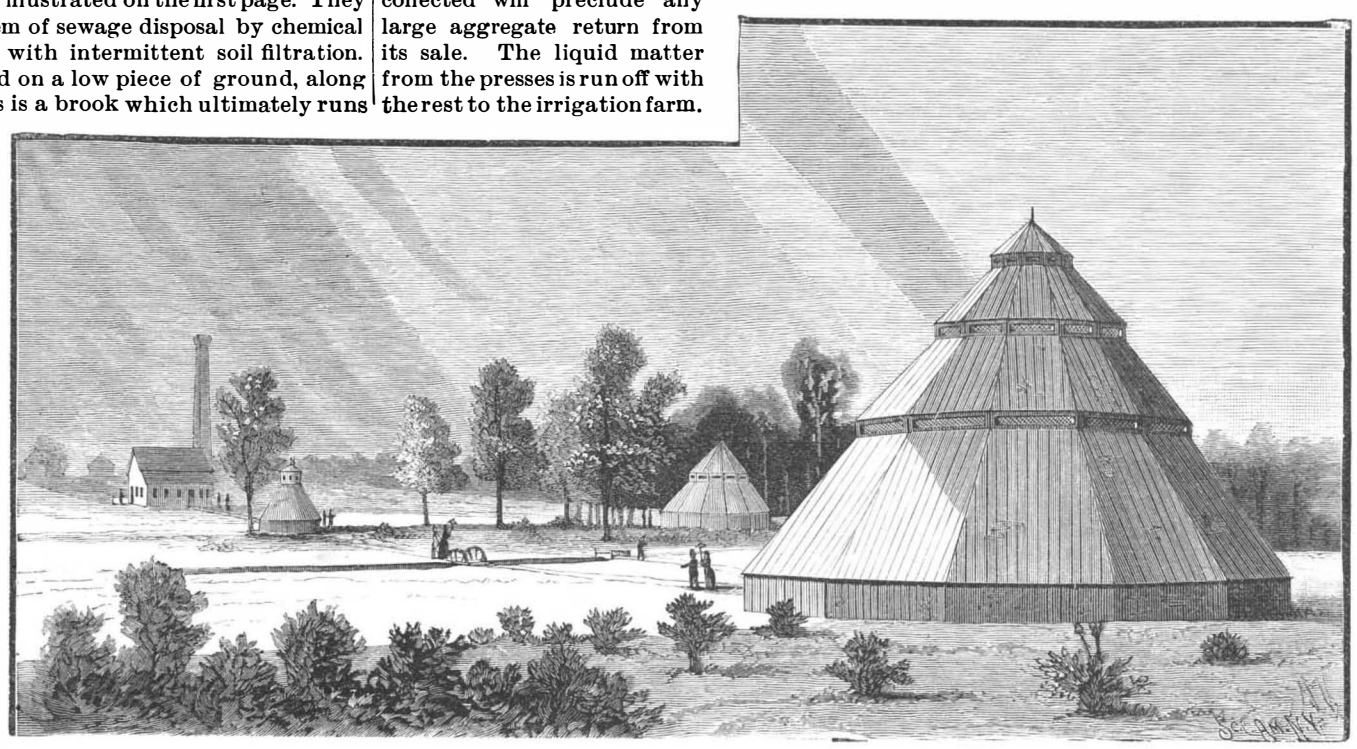
INTERIOR VIEW SHOWING GREAT WELL 100 FEET DIAMETER

Still one more operation is to be provided for, and this is the independent emptying of the tanks, which has to be done from the surface in order to avoid carrying off the solid matter. A low-level main is therefore carried to each of the first divisions. At the bottom of the tanks it is provided with a valve. At the point of its entry into the bottom a pipe is connected to it by a joint, so that it can be swung up or down. At the top the swinging pipe is provided with a filtering arrangement to secure the exclusion of the coarser particles of matter, and floats are attached near its mouth, so that it is always kept at the surface level of the water in the tank, wherever that level may be. When it is desired to empty the tank, the valve at the bottom is opened, the water immediately runs out through the opening of the floating pipe, which sinks with it, and through the conduit connected therewith to the filter beds.

From the end of the tank house a long rectangular open conduit is carried within a few feet of the surface of the ground. It is provided with sliding gates, which can be entirely removed or put in place to check the flow of the water, and it communicates with lateral canals, also provided with similar gates. By means of these the stream of water can be turned over any space desired. The entire farm is, moreover, provided with subsoil drains laid five feet below the surface and communicating with the brook before alluded to. The area, which includes many acres, is cultivated, and grass and various vegetables are grown thereon. Irrigating trenches are run at right angles to the open conduit. The general operation consists of diverting the outflowing stream of clarified, purified sewage to different areas where it may be required. The rest of the operation is entirely automatic; the almost odorless liquid spreads over the ground, is absorbed to a great extent by the vegetation, and any which soaks through is received by the subsoil drains and delivered to the brook perfectly clear. The area irrigated under this new system is considerable, and is to be gradually extended and developed until it is converted into a model farm or vegetable garden. It is anticipated that the richness of the soil will render the return from the crops very lucrative, and it is expected that the revenue from this source will go far toward paying the running expenses of the works. Of course at present this is in an experimental state, and no figures can yet be given which would have any bearing in determining the value of the experiment as regards this feature.

The works have now been running some five months, and of course have not yet been subjected to the trials of winter. Should any difficulty arise in disposing by filtration of the liquid matter, on account of frost, it will be treated more thoroughly with chemicals, so as to be perfectly clear and inoffensive, and then will be delivered directly to the brook.

The water works are of special interest as possessing one of the largest wells in the world, which is illustrated in the cuts. It is excavated in the solid rock to a depth varying in places, but averaging about 25 feet, and is 100 feet in diameter. This is not the only source of supply. There are two more wells, one 25 feet the other about 50 feet in diameter, which contribute their share. The locality selected for them was low and characterized by the presence of springs. The pumping is done directly from the 25 foot well. Communication is maintained between the 100 foot and 25 foot well by a siphon. From the bend of the siphon, where it enters the smaller well, a small pipe connection is made to the suction tube, so that a continual suction is exerted upon the siphon. It has been found by experience that the siphon never needs recharging, owing to this ingenious arrangement. A compound Gaskel pump engine pumps the water directly into the mains, where a pressure of a specified head of water is continually maintained.



EAST ORANGE WATER WORKS.

The large well, filled with crystal water, through which the bottom of red sandstone can be clearly seen, is a most interesting object. The level of the water changes very little, however great the drain upon it may be, and is independent of the level in the other wells. Its temperature is also nearly constant in summer and winter. The analysis shows the water supplied by the group of wells to be of remarkable purity.

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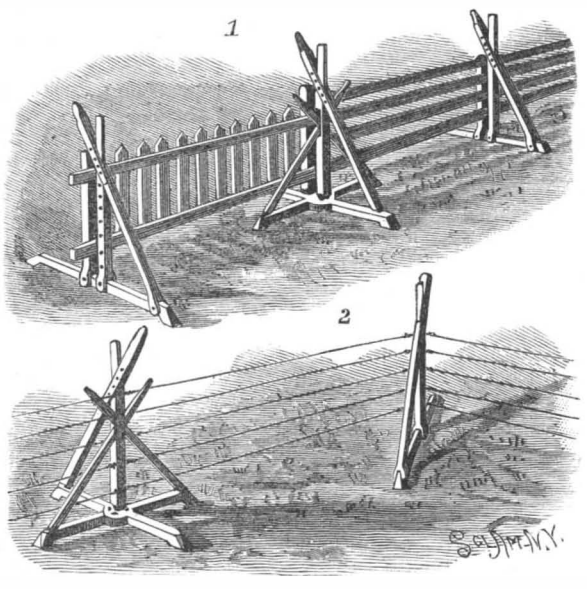
The water works are the property of a private corporation; the sewage works belong to the township. With these two improvements added to its beautiful residences and macadamized and telfordized roads, East Orange may claim to be a model community. Not the least striking feature is the fact that these improvements were executed when it was only a township, possessing the simplest forms of administration, not having reached even the dignity of a village charter.

Coffee and its Effects.

Coffee owes its stimulating and refreshing qualities to caffeine. It also contains gum and sugar, fat, acids, casein, and wood fiber. Like tea, it powerfully increases the respiration; but, unlike it, does not affect its depth. By its use the rate of the pulse is increased and the action of the skin diminished. It lessens the amount of blood sent to the organs of the body, distends the veins and contracts the capillaries, thus preventing waste of tissue. It is a mental stimulus of a high order, and one that is liable to great abuse. Carried to excess, it produces abnormal wakefulness, indigestion, acidity, heartburn, tremors, debility, irritability of temper, trembling, irregular pulse, a kind of intoxication ending in delirium and great injury to the spinal functions. Unfortunately, there are many coffee tipplers who depend upon it as a drunkard upon his dram. On the other hand, coffee is of sovereign efficacy in tiding over the nervous system in emergencies. Coffee is also, in its place, an excellent medicine. In typhoid fever its action is frequently prompt and decisive. It is indicated in the early stages before local complications arise. Coffee dispels stupor and lethargy, is an antidote for many kinds of poison, and is valuable in spasmodic asthma, whooping cough, cholera infantum, and Asiastic cholera. It is also excellent as a preventive against infectious and epidemic diseases. In districts rife with malaria and fever, the drinking of hot coffee before passing into the open air has enabled persons living in such places to escape contagion.—*Journal of Commerce* (*Boston*).

AN IMPROVED FENCE.

A fence of novel construction, which may be set plumb on rolling or sloping lands, and readily erected or removed, is illustrated herewith, and has been patented by Mr. John M. Fellows, of Burlington, Ind. The main posts, and the intermediate or corner posts, are adapted for use either with rails or pickets or wires. The base of the main post has four arms, the extremities of the arms being bent down to form feet, and at the center of the base is an eye bolt engaging loosely the lower end of the upright, or post proper, the upper end of which is cut away to form a tenon, and on the shoulders thus provided on the main post rests the upper slotted end of an inside side brace. The tenon passes through the slot in the upper end of the brace, and is connected therewith by a nutted bolt or pin, passed through one of a series of holes in the brace, to allow of the latter being set at different angles, according to the nature of the ground. Other braces, pivoted to the opposite base arms which lie parallel with the fence, have their upper ends passed

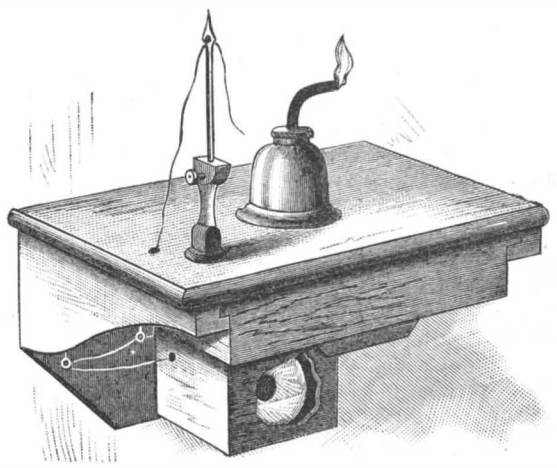


FELLOWS' FENCE.

through a slot in the post, where they are adjustably held in position by a pin passed through one of a series of holes in both braces, whereby the post may be set plumb both ways, and locked in position by the pinned braces. A post to be alternately used has a cross piece or base ranging transversely to the fence, this post having a pivoted upright, a pivoted inner brace, and an outer pivoted face post or upright. All parts of these posts are preferably to be made of cast or wrought metal, to be light and strong, and give substantial support to the rail or wire stringers of the fence.

AN IMPROVED NEEDLE AND TWINE CUTTER.

A simple and effective device, whereby packages of paper, money, etc., may be expeditiously punctured and tied, is illustrated herewith, and has been patent-



WOOD'S NEEDLE AND TWINE CUTTER.

ed by Mr. Fremont E. Wood, of Yucca, Arizona Ter. It is designed for use preferably in connection with a little stand or bracket, to support a lamp for sealing purposes, and a drawer for wax, pens, cord, etc., the body of the device having at its lower end a threaded stud or pin adapted to be screwed in the support. It has a neck essentially diamond-shaped in cross section, making opposing cutting surfaces, above which is a longitudinal aperture, and a set screw, whereby a needle with spear-like head, in which is an eye, may be firmly held in vertical position. With this device twine or ribbon may be conveniently used, and readily cut off at the desired length after the package has been tied.

He Fastened Down the Safety Valve.

It is almost incredible that a man in his senses should walk up to a boiler which is discharging steam through its safety valve, and deliberately close that only avenue through which the surplus steam might escape to prevent a dangerous over-pressure.

And yet this thing is done with a frequency which is alarming. Only a few days since, we learned from an inspector that he had found a battery of boilers, every safety valve upon which was wedged down by a pine plug, "to keep them from leaking;" and now come the particulars of an explosion in this State, reciting that one Arthur Leavitt, annoyed because the escaping steam from the safety valve of his boiler made his horses restless, fastened the valve down with a heavy weight. The natural consequence ensued, and, although swift retribution was meted out to the offender, he carried into eternity another and innocent man, while as a result of his criminal act two men are suffering serious injuries, a pair of valuable horses and a large factory are destroyed, and a prosperous business seriously interrupted.

The man who will deliberately tamper with the safety valve of a steam boiler is a first-class rascal. If the consequences of his act reverted upon himself alone, he might be forgiven, but there is no knowing how widespread and disastrous may be the results of his folly, and he should be placed in the same category as the man who would put a fuse to a power magazine or lay the train to incite a conflagration.—*Power and Steam.*

What Constitutes a Faithful Employe.

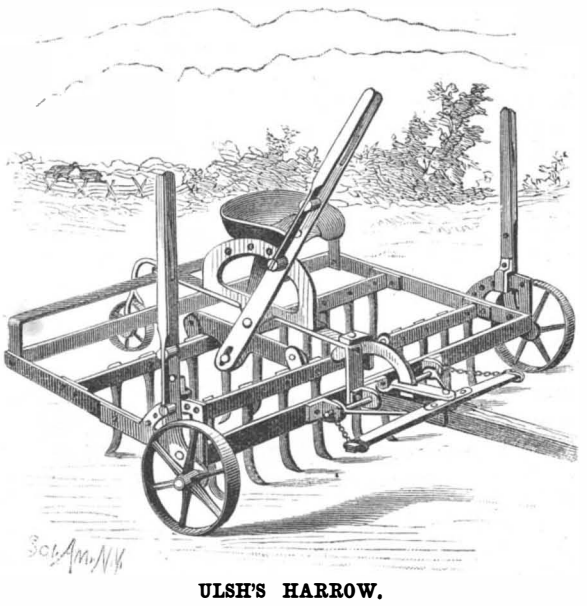
An exchange says: Every faithful employe will constitute himself the guardian of his employer's property. The man who will either willfully waste what is intrusted to his care, or encourage such waste in others, is unworthy of confidence, and, should he ever become the head of a business, will deserve to be treated in the same way.

There is a vast deal of truth in the above, adds the *Industrial World*, and yet how many workmen there are who willfully squander not only the property of their employers, but, what is equally valuable, the time which the latter pays for.

Workmen do not seem to know that the prosperity of a manufacturing concern oftentimes depends upon the observation of closest economy. The enlargement of the wage fund depends on this economy, and any fair-minded employer would rather expend in wages the amount saved by economical observance than have the amount wasted. The little waste here and there that seems so trivial to the workman, when scattered through a great number of hands amounts in the total to a large sum. When a workman, sees the first evidence of a machine getting out of order, by drawing the attention of the proper parties he may save an expensive bill of repairs and also a considerable loss consequent upon the idleness of the machine while undergoing repairs. The careless workman says, "It is none of my business whether the machine gets out of repair or not," and so he lets it run on until it is entirely disabled. A workman observes a quantity of material carelessly left where it will deteriorate or be spoiled Instead of taking care of it, or notifying the manager or superintendent, he allows it to remain and be destroyed or injured, consoling himself with the thought that "it is none of his loss any way." Perhaps he observes a brother workman willfully wasting or injuring the material upon which the latter is working Duty would tell him to inform the foreman of such a dereliction on the part of his fellow laborer, but he does not, for lack of interest in his employer's welfare. He may see where a saving could be made in the manipulation of the material upon which he is working, yet for lack of interest he refrains from making any suggestions leading to the discovery of that fact. Not infrequently the workman refrains from protecting his employer's rights and property because by so doing it will entail additional labor or care upon himself, or impose a responsibility which he does not wish to assume. Some seem to think there is no obligation incurred by them when engaging themselves to work except such as is included in the rule of "doing the least work for the most pay." Such men shuffle through their labors, slighting the work here, wasting material there, squandering all the time they can, and thinking of no one's interest save their own. This class of workmen are the first to be dismissed when hard times come. When wages fall, theirs are the first to be lowered. If the force of the shop, by reason of slack trade, has to be curtailed, they are the ones selected to leave. Self-interest teaches the manufacturer to give the best places and the largest remuneration to his most faithful workmen. This is not only natural, but right and commendable. The employe who thinks most of doing his work well and of subserving his employer's interests, and less of combinations and strikes, will succeed the best and rise the highest and the most rapidly in the scale of prosperity.

AN IMPROVED HARROW.

A harrow adapted for conveniently adjusting the teeth to enter the ground any required depth, or at any angle, or in which they can be raised out of action as desired, and readily locked in any of their adjustments, is illustrated herewith, and has been patented by Mr. James M. Ulsh, of Steelton, Pa. To the outside of the side beams of the frame, near its front ends, are pivoted elbow levers, the shorter arms of which project forward and form at their ends bearings for the axles of the main supporting wheels, the longer arms projecting upward and forming handles, whereby the wheel bearings can be adjusted at any desired height, and the frame thus caused to travel at any desired height above the ground. Segmental plates are provided with which the elbow levers can be readily locked in any position to which they may be adjusted. On the front end of a central elevated brace is a keeper, receiving adjustably a segmental bar fixed to the draught tongue, by which the frame of the machine may be rigidly connected to the tongue at any height. In bearings on the inside of the side beams are mounted to turn the end pivots of two transverse tooth bars, the teeth being beveled and curved at their ends. The arrangement is such that the points of the teeth of each row will alternate in position with those in the other, and, by turning the tooth bars on their pivots, the teeth can all be swung up into the frame of the machine, so as to



ULSH'S HARROW.

be inactive, or held downward in an approximately vertical position, to cut the ground edgewise, or into any intermediate desired. The transverse tooth bars have upwardly projecting arms, connected together by a longitudinal bar, the latter connected to a lever pivoted to the elevated brace, and forming a handle by which the two rows of teeth can be easily adjusted together in any of the positions described, the handle lever having a segmental plate-locking device. A model of this machine may be seen at the office of Messrs. Bonner & Murguiondo, No. 186 Remsen Street, Brooklyn, N. Y.

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Correspondence.

Iron Melting.

To the Editor of the Scientific American:

I have carefully read the article on iron melting in your issue of October 20, 1888, and do not agree with it as a whole. I believe if cupola blast and all things connected with melting iron are right, there will be but little trouble in melting 10 to 1 or even better than that. A man from Marshall, Texas, offers $250 to any one who will melt 9 tons at the rate of 14 to 1 in his 38 in. cupola. In my opinion a cupola that size is far too small to melt such an amount of iron, and I think there is no more chance to practice economy with a cupola that is too small than with one too large. My experience is rather limited, and I will be careful not to say too much.

I am in the habit of melting from 3 to 5 tons of iron per day, and see no reason why I could not melt 20 tons at the same rate, that is, 10 to 1.

When I first took charge here, I found I could not melt better than 6½ to 1, but have made several changes about the cupola, and can now melt every day we run more than 10 to 1.

The iron is plenty hot enough for our lightest castings, and as long as cupola runs a stream the iron is fit to use. Below you will find my average for eight heats. I use an old style cupola, 38 in., with three tuyeres:

	Iron.	Fuel.
August 22, 1888	7,200 lb.	675 lb.
" 23, "	7,600 "	700 "
" 24, "	7,600 "	700 "
" 25, "	7,600 "	700 "
" 27, "	6,900 "	625 "
" 28, "	6,500 "	600 "
" 29, "	6,200 "	575 "
" 31, "	6,100 "	575 "

I would be pleased to melt before witnesses if any one doubts the above. I weigh all fuel and iron used, and know just what I am doing.

JOHN H. CROUSE,
Foreman, J. O. Wisner, Son & Co. foundry.
Brantford, Can., November, 1888.

Two Wrinkles.

To the Editor of the Scientific American:

Some parties are doing quite a business in different cities advertising and selling an "outfit" for copying letters without the use of a copying press or water. The "outfit" consists of an ordinary tissue paper copying book, a sheet of blotting paper, a piece of smooth pasteboard, and a bottle of special ink. The whole trick is in the ink. Any copying book will do.

I saw through the thing as soon as I saw a copy, and tried it at once with perfect success.

I just took ordinary ink and mixed glycerin with it. I wrote a long letter with it, blotted the letter very lightly, then placed it under a tissue leaf of the copying book, and rubbed the latter with my fingers, getting a very fair copy and then a second copy.

Of course a copying press and water are both unnecessary.

All that is needed is to take any ordinary ink and mix glycerin with it, say one-fourth to one-third of the volume of the ink.

The glycerin keeps the writing wet till copy is taken, and on this account—its slow drying quality—this ink is not convenient for other than copying work.

There is another interesting trick in another line, whereby the advertiser sells ordinary head light kerosene for $10 a gallon, which is a pretty fair profit, as it only costs 7½ cents. A compound in five-ounce bottles is extensively sold to printers under various names as "Inkoleum," "Rollerine," etc., at 50 cents per bottle, or $10 a gallon.

It is used to put on printers' rollers, to thin printers' inks, etc., a few drops only being used.

Every printer has plenty of coal oil in his house, and it looks funny to see him send 50 cents to get five ounces of it. But he never thinks of trying the coal oil that he has in his oil can. The trick here is in disguising the kerosene so that the printer does not know it is kerosene. The peculiar *fluorescence* of kerosene is destroyed by adding a small amount of resin oil. To make this resin oil mix with the kerosene, a little sulphuric ether is added.

A little oil of cedar disguises the kerosene smell, and so the printer pays 50 cents a bottle when he already has plenty of kerosene in his house, five ounces of which cost him about one-fifth of a cent.

The only useful element in the mixture is the kerosene. A. B.

Cincinnati, November 3, 1888.

IT is said that corn cobs, when treated as follows, make an excellent fire kindling: Put six gallons of water into a boiler, and one pound of saltpeter. Heat it to the boiling point, and then put in as many cobs as the water will cover. Let them stand a short time, and then take them out and place in the sunlight until thoroughly dry, when they can be easily lighted with a match and will make a hot fire.

The Making of Postal Cards.

The people of the United States use annually about seven postal cards for every man, woman, and child; that is to say, our total consumption for a year reaches 400,000,000, which is considerably more than are employed by all the rest of the world. This enormous number are all printed, cut apart, counted, and wrapped up in packages of 25, by machinery that would stand comfortably in a small bedroom, and that requires no assistance whatever from any operative, so long as it is supplied with paper, ink, and paste. A visit to the abode of this wonderful mechanism is naturally full of interest.

The postal card factory—the only one in this country—is a part of the great establishment of the Fort Orange Paper Company (C. C. Woolworth, president), at Castleton, near Albany. These works, employing 200 hands and occupying (though, of course, not covering) a tract of 35 acres of land, have quite a picturesque location among the hills a mile back from the village, with which they are connected by the New York Central, Hudson River, and Fort Orange Railroad—the name is about as long as the track—and include every appliance for the manufacture of many different kinds of paper and cardboard—white, brown, and colored. Approaching the place from Castleton, one notices first the immense and very graceful chimney, founded on solid rock and rising 126 feet into the air— a tower-like structure of no little beauty. Around and near this are grouped a number of large buildings, one of which we will enter, following the course of the raw material from which, in part, most kinds of paper are made—being bales of rags of every possible color, size, shape, and condition of dirtiness. This unpleasant stuff needs a lot of cleansing, as may well be imagined, and accordingly the first thing done with it is to toss it by handfuls into a "duster," where it is tossed and shaken at a great rate, and liberated, so far as may be, from adhering and extraneous dirt. Next it goes to a long line of women and girls, who remove hooks and eyes, buttons, rubber, fragments of whalebone, and whatever other foreign material they find. Then it is cut up by a fast-running steam-driven machine into fragments of moderate size, dusted (or ought we properly to say *un*dusted?) again by another machine, and dropped into great boilers below, where for six or seven hours it is subjected to the action of a hot chemical liquid, under pressure, to loosen its color and its still remaining dirt. Coming from the boilers, it is thoroughly washed by special mechanism, pure water being forcibly driven through the mass, and is then soaked for three or four days in a solution of chloride of lime, which bleaches it completely, leaving it pure snowy white. It is next beaten and squeezed by beating engines until reduced to a semi-pulpy condition,* and then conducted into large hogsheads called "stuff chests," whence it is pumped directly to the Fourdrinier paper machine.

This imposing piece of mechanism, really a compound of a variety of machines by which a great number of operations are kept going simultaneously and harmoniously, receives at one end the pulp prepared as above, which comes pouring in from the stuff-chests in the form of a very thin, watery paste; and delivers, at the other end, the completed paper, calendered to its final surface, trimmed at the edge, and tightly rolled up like so much ribbon. The pulp first flows upon a fine wire netting, where it is sharply shaken for the purpose of causing its fibers to knit together like felting and acquire some degree of consistency. Then passing along on endless blankets, it is squeezed by a succession of rollers to get it into proper shape and remove the moisture (some of the rollers farthest along being steam-heated, to aid the drying), and finally pressed hard or "calendered," to smooth the surface, and wound up in rolls. We should not think that more than two or three minutes could elapse between the entry of any particular portion of the pulp into the machine at one end and its exit from the calenders, finished paper, at the other, and during that time it has traveled 125 feet.

Now supposing that it is postal card paper that we have been watching, we follow a roll of it to the printing room and see it put into the combined printing press, cutter, counter, and wrapper—a machine that the inventor thought he could construct in three weeks at a cost of five hundred dollars, but it actually took four years and *eight thousand* dollars. This machine prints from a number of engraved plates on the surface of a fast revolving cylinder, against which the web of paper is closely pressed, thus repeating the pattern over and over again on the ribbon, as one might say; and then, as before stated, cuts the cards apart, wraps them up in packages of 25, with a band pasted around each, and delivers them by belt conveyors to the packing tables, where girls put them into paper boxes, each holding 500 cards. These again are inclosed in wooden cases of varying size, and shipped to every post office in the United States—so that the dispatching department of the works may be said to have some sixty thousand separate customers to attend to. Orders for the current month are unusually heavy, aggregating fifty-five to sixty millions, which will weigh about 175 tons; and we saw a fireproof vault containing some 25,000,000 cards ready to go. These are all domestic postal cards, it should be understood, no international cards having been called for during the last six or eight years. They now cost the government 48 cents per thousand, being less than two-thirds of the sum paid when they were first manufactured.—*Country Gentleman.*

* And mixed with wood pulp, when that material is employed.

Patents for Small Things.

Among these may be mentioned the "stylographic pen," and a pen for shading in different colors, producing £40,000 per annum. The rubber tip at the end of lead pencils has yielded £20,000. A large fortune has been reaped by a miner who invented a metal rivet or eyelet at each end of the mouth of coat and trousers pockets, to resist the strain caused by the carriage of pieces of ore and heavy tools. In a recent legal action it transpired in evidence that the inventor of the metal plates used to protect soles and heels of boots from wear sold upward of 12,000,000 plates in 1879, and in 1887 the number reached 143,000,000, producing realized profits of a quarter of a million of money. As large a sum as was ever obtained for any invention was enjoyed by the inventor of the inverted glass bell to hang over gas to protect ceilings from being blackened, and a scarcely less lucrative patent was that for simply putting emery powder on cloth. Frequently time and circumstances are wanted before an invention is appreciated, but it will be seen that patience is well rewarded, for the inventor of the roller skate made over £200,000, notwithstanding the fact that his patent had nearly expired before its value was ascertained. The gimlet-pointed screw has produced more wealth than most silver mines, and the American who first thought of putting copper tips to children's shoes is as well off as if his father had left him £400,000 in United States bonds. Upward of £2,000 a year was made by the inventor of the common needle threader. To the foregoing might be added thousands of trifling but useful articles from which handsome incomes are derived or for which large sums have been paid. Few inventions pay better than popular patented toys. A clergyman realized £400 a week by the invention of a strange little plaything to be seen for a long time in every toy shop window, and even in the streets of London. That favorite American toy, the "return ball"—a wooden ball with an elastic attached—yielded the patenee an income equal to £10,000 a year, and an income of no less than £15,000 per annum to the inventor of the "dancing Jim Crow." The invention of "Pharaoh's serpents," a toy much in vogue some years ago, was the outcome of some chemical experiments, and brought the inventor more than £10,000. The sale of the little wooden figure "John Gilpin" was incredibly large for many years, and a very ingenious toy, known as the "wheel of life," is said to have produced upward of £100,000 profit to its inventor. One of the most successful of modern toys has been the "chameleon top," the sale of which has been enormous. The field of invention is not only vast and varied, but is open to everybody without respect to sex or age, station or means.—*Invention, London.*

Youth and Old Age.

A writer who is a good observer, and has had considerable experience, thus defines the difference between the old and young. There is, he says, a wide gulf between youth and ripe old age, hence the proverb "You can't put an old head on young shoulders." This proverb was written by an old man; youth had nothing to do with it. Youth don't believe the old man knows anything, and the old man expects continually that the young man will be along saying, "I didn't know it was loaded." The wise young man will seek the counsel of those ripe in years and experience and avoid the mistakes in life. But Young America will continue to figure in the divorce courts, and compound his debts at ten cents on the dollar. He don't want to be told that it is loaded; he prefers to find out himself. He gets there, and pays the piper generally.

What is Luck?

A philosophical definition of luck is given by an English writer as a capability of being incapable. "The first Rothschild was probably right, from his point of view, when he said that he never would employ an unlucky man. On the other hand, the lucky man is usually the man who fits his fortunes; who, whether apparently able or stupid, can do just what his especial circumstances require him to do. Very stupid men are often ready men, armed with a readiness as of dogs when they twist from under a cartwheel unhurt. The 'fool who makes a fortune' is usually a man with just the foresight or just the judgment or the intuitive perception of the way things are going—a faculty like long sight or keen hearing, and independent of intellectual power—requisite to make large profits quickly. In fact, the fortunate man is usually the man who, in consequence of some hidden quality in his nature, deserves fortune."—*Popular Science Monthly.*

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THE BAXTER ELECTRIC MOTOR.

Early electricians had only a slight conception of the possibilities of electrical science. The discovery of the galvanic current, the invention of the voltaic battery, and many other comparatively early electrical discoveries and inventions were vitally related to the later development of the science, and were, as they are still, of great utility; but it was not until Faraday made his brilliant discovery of magneto-electric induction that electrical science gained any marked impetus. From Faraday's time to the present, progress has been made in an almost geometrical ratio, and it may be truthfully said that no branch of science has been developed with such rapidity and thoroughness as that of electricity.

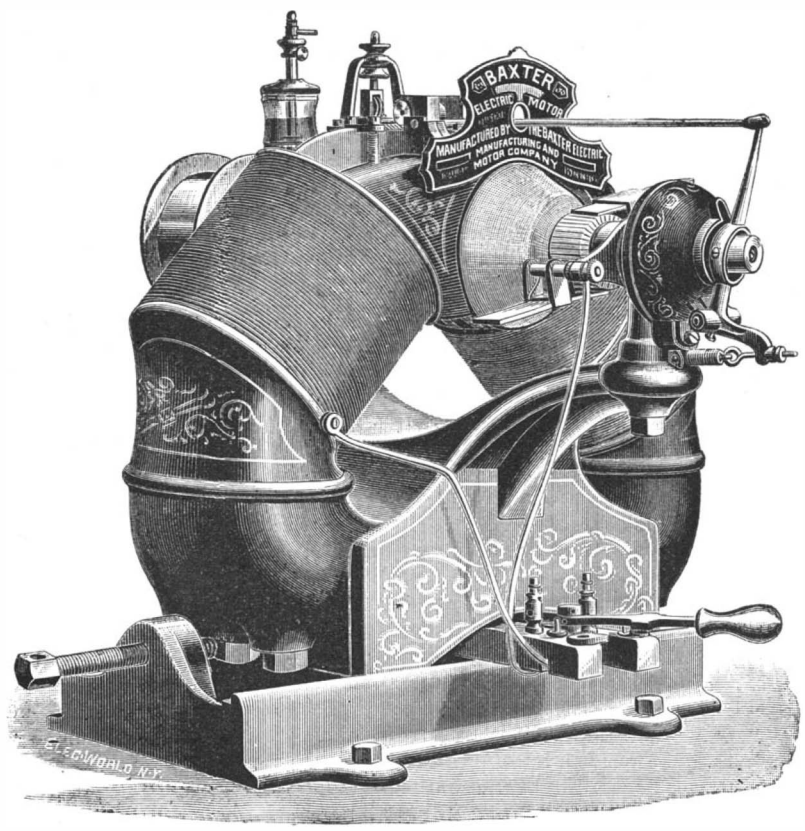
The most important result of the discovery of magneto-electric induction is the invention of the dynamo-electric machine, by means of which steam or water power is converted into electrical energy. Following this are the inventions which provide ways for distributing electrical energy so that it may be utilized anywhere within the radius of from one to twenty miles from a dynamo or generator, for electrical illumination or for power in very large or very small quantities.

It is well known to those at all conversant with the subject that there is no essential difference between a dynamo and a motor. Any machine which is efficient as a generator of the current will also serve to convert electrical energy into mechanical energy. Certain refinements of the machine, however, are necessary to secure the best results in the utilization of the current. For instance, it is important to provide a machine which will absorb only so much of the current as is needed for a particular use. It is also essential to construct a motor so that it will maintain a practically uniform speed under all loads. It is also necessary, especially when the motor is used in a circuit of high voltage, to arrange it so that in starting the current will be gradually applied to the armature.

The Baxter electric motor, which we illustrate, is constructed with a view to carrying out these principles in the simplest and most practical way. The manufacturers of this motor have succeeded in producing a type of machine for any power from $\frac{1}{10}$ horse power to 20 horse power, adapted to work on constant current, and from $\frac{1}{4}$ horse power to 150 horse power on constant potential circuits, the machines being constructed differently, to adapt them to different conditions. They are known as "constant current" or "constant potential" motors as the case may be. These motors have been applied to work which has heretofore required steam engines, gas or air engines, and have been used for running every variety of machine, from a sewing machine to a printing press, or even a whole workshop or factory. In addition to the manufacture of these motors, the Baxter Electric Manufacturing & Motor Co. are building generators of 150 horse power capacity to be used in the distribution of power, and contemplate carrying the size upward as the demand increases.

The Baxter electric motors are examples of excellence of workmanship, are graceful in design, compact, silent, easily cared for, and always ready for instant use. In the "constant potential" machines, the field magnets are shunt-wound, enabling the motors to regulate themselves very perfectly, at the same time rendering them very efficient. This construction also tends to a great extent to prevent the burning out of the armature. As a further safeguard, each machine is provided with a cut-out box, which cuts out the current automatically when from any cause it becomes too great. This box also serves as a convenient means for turning on and shutting off the current.

In the "constant current" machines, the regulation is secured by the action of a centrifugal governor carried by the end of the armature shaft. This governor moves a contact roller over a series of copper strips connected with the convolutions of the field magnet. The "governing" is effected by cutting out these convolutions successively when the speed increases, even imperceptibly, and a reverse action takes place when the speed tends to diminish.



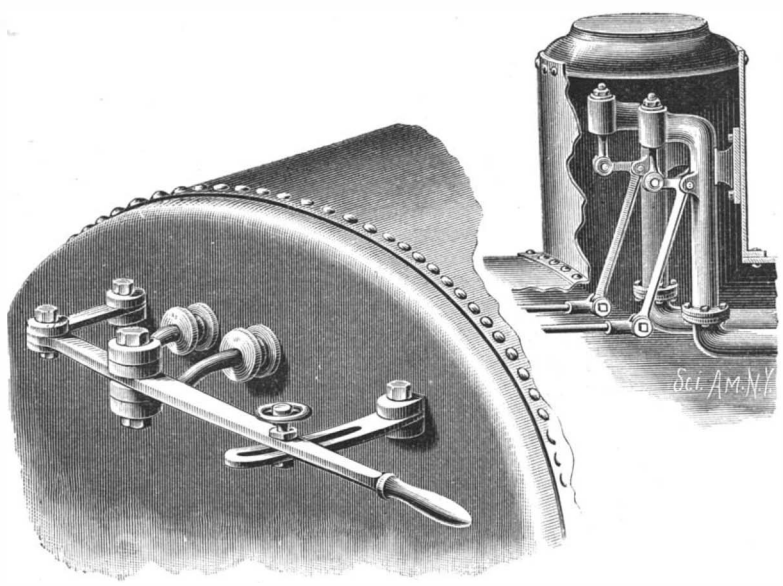
BAXTER ELECTRIC MOTOR.

The Baxter motor is at present operating over one hundred industries. In Baltimore they have been adopted so extensively that the local Brush company was obliged, some time since, to construct four special Baxter motor circuits. From these circuits the motors are supplied with currents for driving an immense number of sewing machines, ventilator fans, turning lathes, printing presses, shoe factories, and machinery of every description. In Johnstown, N. Y., the Brush company has also constructed a special power circuit to supply the Baxter motors there in use. In Troy, N. Y., every printing establishment in the city (with a single exception) employs the Baxter motor to run its printing presses. In Boston, N. Y. City, and New Orleans, the motors have been very extensively used; in fact, they are in successful use all over the United States.

As an example of the wearing qualities of the Baxter motor, we mention the fact that in one of the old shops of this company a ten horse power Baxter motor, after more than a year's continuous running, was examined, and the commutator was found but slightly worn, the machine never having been stopped for an hour during the entire period for repairs.

The business of this company has increased to such an extent as to necessitate the building of a new factory especially arranged for the manufacture of dynamos and motors. The factory consists of two large buildings located in the suburbs of the city of Baltimore, Md., one being a two-story brick workshop 260 ft. long and 60 ft. wide; the other, including engine and boiler room, furnace room, paint shop, etc., being 150 ft. long and 50 ft. wide. This factory is well equipped with modern machinery and appliances, and everything has been arranged with a view to the production of the most perfect work.

The Baxter company has offices in all the principal cities of the country, that in New York City being located in the Potter Building.



FULLER'S LOCOMOTIVE BOILER.

AN IMPROVEMENT IN LOCOMOTIVE BOILERS.

A device providing a live steam pipe for each engine, by which the dry steam is supplied to one of the engines in case the other is disabled, the throttle valves being detachably connected to a single operating lever, is illustrated herewith, and has been patented by Mr. Middleton G. Fuller, of Ten Mile Hill, S. C. Into the usual steam dome extend two dry pipes, each leading to the cylinder of one engine, the usual throttle valves being held in the upper ends of the pipes in the steam dome, these valves being secured to links pivotally connected with the short arms of bell crank levers connected by their long arms with rods which pass through the usual packings in the end plate of the boiler. The outer ends of the rods are curved toward each other and are pivotally connected by bolts with the throttle valve lever, the connecting bolts being placed one above the other, so that both rods have the same leverage on the throttle valve lever. If one of the engines becomes disabled, the engineer removes the upper or lower bolt connecting a corresponding rod with one of the throttle valves, so that the movement of the throttle valve lever then acts on only one valve, while the other remains stationary. The engineer is thus enabled, in case of an accident on the road, to supply sufficient steam to one engine to serve temporary purposes and prevent delay.

Another Generous Gift for Industrial Education.

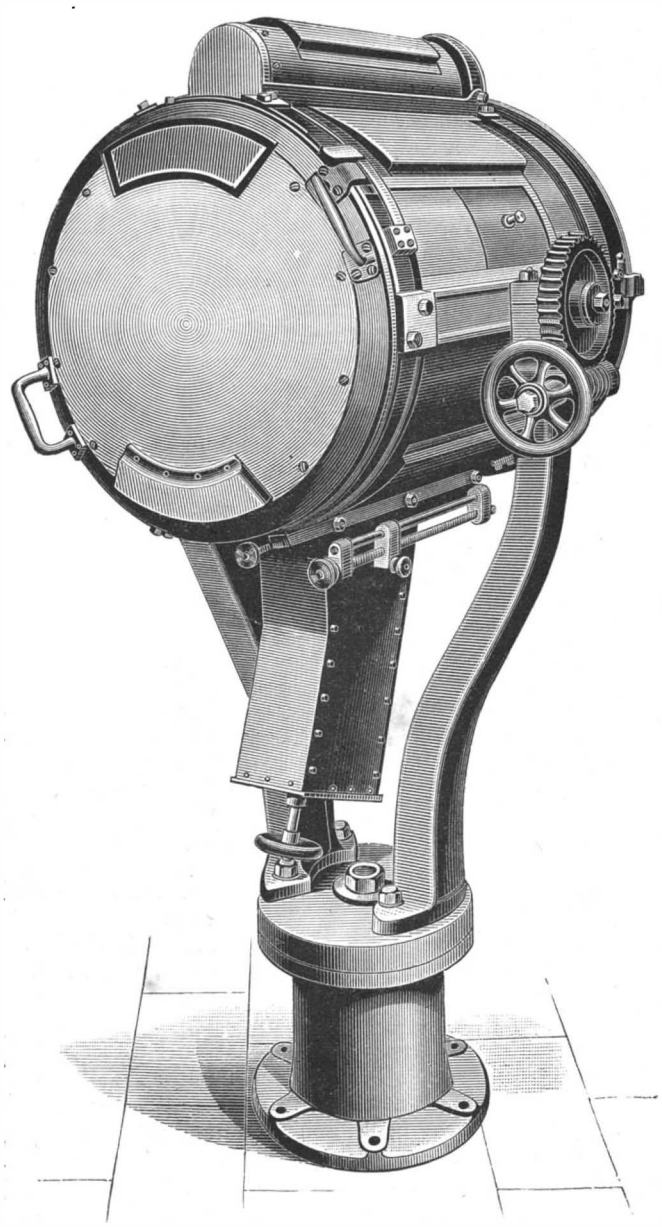
J. V. Williamson, the millionaire of Philadelphia, is about to found an institution similar in many respects to Girard College. He has determined to begin operations at once and, though feeble in health, hopes to finish during his lifetime. The cost is estimated at over $5,000,000. It is to be an institution for the education of boys in all departments of mechanical labor. Mr. Williamson has appointed seven trustees to manage the business, whose names are carefully kept from the public for the present.

Spider Poisons.

Professor Breeger has recently investigated the poisons of spiders. He found that the Russian varieties of spider, *Phalanchium* and *Trochosa* (tarantula), are non-poisonous, but that a third, *Caracurt* or "black wolf," secretes a powerful poison, forming 25 per cent of its whole weight. This substance is a peculiar, unstable alkaloid, destroyed at 60 deg. C., or by alcohol. Introduced into the circulation of warm-blooded animals, one-thirtieth of a milligramme per kilogramme of the animal treated was sufficient to cause death. It exceeds in power all known vegetable principles, and prussic acid, being comparable in toxicity with the poison of snakes.

IMPROVED PORTABLE ELECTRIC LIGHT APPARATUS.

Messrs. S. Charlesworth & Co., electrical engineers, Oldham, have recently sent to the Suez Canal an improved patent portable electric light plant for the use of steamers on the canal at night. The plant consists



IMPROVED PORTABLE ELECTRIC LIGHT APPARATUS.

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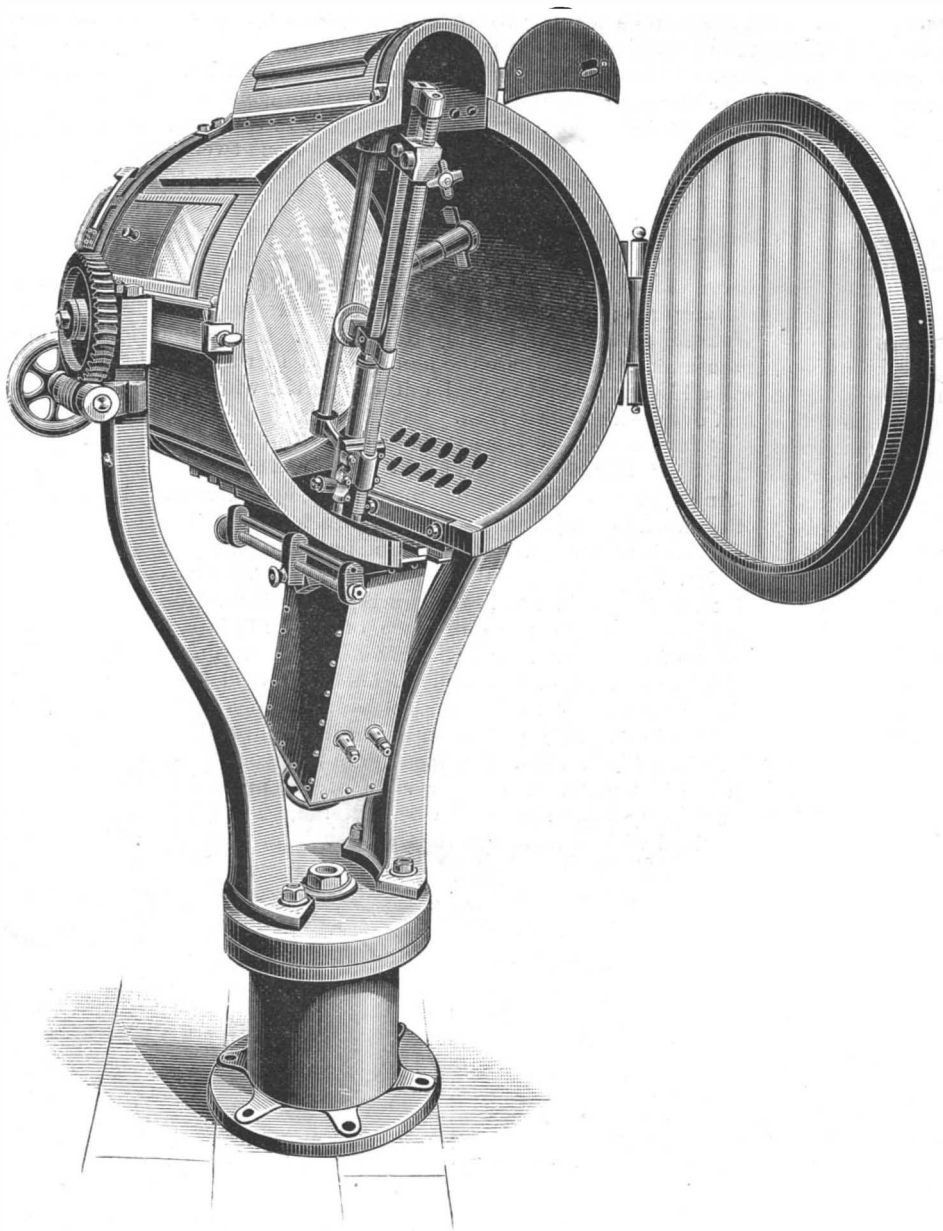
of an engine and dynamo coupled together on one bed plate, a search light projector to be placed at the ship's bow, and an arc lamp to hang in the rigging. The engine is supplied with steam from the ship's boilers, ball and socket joint pipes being used to make the connection, the exhaust being conveyed by a flexible pipe either overboard or to the ship's exhaust pipe.

The engine and dynamo are shown in the engraving. The engine is of the vertical inverted open-frame type, this form having been decided upon as the result of practical experience in preference to any rotary or closed-in engine. The cylinder is 7 in. diameter, stroke 6½ in., and speed 425 revolutions per minute. It is usual, in passing through the Suez Canal, on account of the slow speed at which the vessels proceed, to allow the pressure in the boilers to fall considerably below the normal, and on this account the engine has been constructed to work at the low pressure of 40 lb. per square inch. On some vessels, however, this custom is not followed, pressures as high as 120 lb. being carried occasionally. A throttle valve governor does not work efficiently as a reducing valve through such a wide limit, and so a hand expansion gear is arranged capable of varying the cut-off from one-fourth to about five-eighths of the stroke. By this means the engineer can set the cut-off to suit the pressure, leaving a reasonable margin for the governors to deal with. In order to reduce wear on the valve gear, a piston valve is used. The crank shaft is of Whitworth steel, with cast iron balancing disks shrunk on to the crank webs. One of Messrs. Charlesworth's No. 5 dynamos, inverted, is carried on the same bed plate as the engine, the armature shaft being connected to the crank shaft by means of a conical interchangeable coupling. It is compound wound, and gives 65 volts and 55 amperes at the speed of 425 revolutions per minute. The resistances are as follows: Armature, 0·151 ohm; shunt, 39·87 ohms; series, 0·037 ohm. Owing to the climate where it has to work, it was necessary to allow considerable margin for heating, and the machine has been made somewhat large for the work it has to do. In order to protect the engine and dynamo from injury when being lifted on and off the steamers, they are inclosed in a steel box, not shown in the engraving, the sides of which can be removed when working. A ring bolt is provided on top for lifting, and rollers on the bottom. The engine has no tendency to walk about when working, so that there is no necessity to bolt it down, a few wedges only being required under the bed plate to take up the round of the deck.

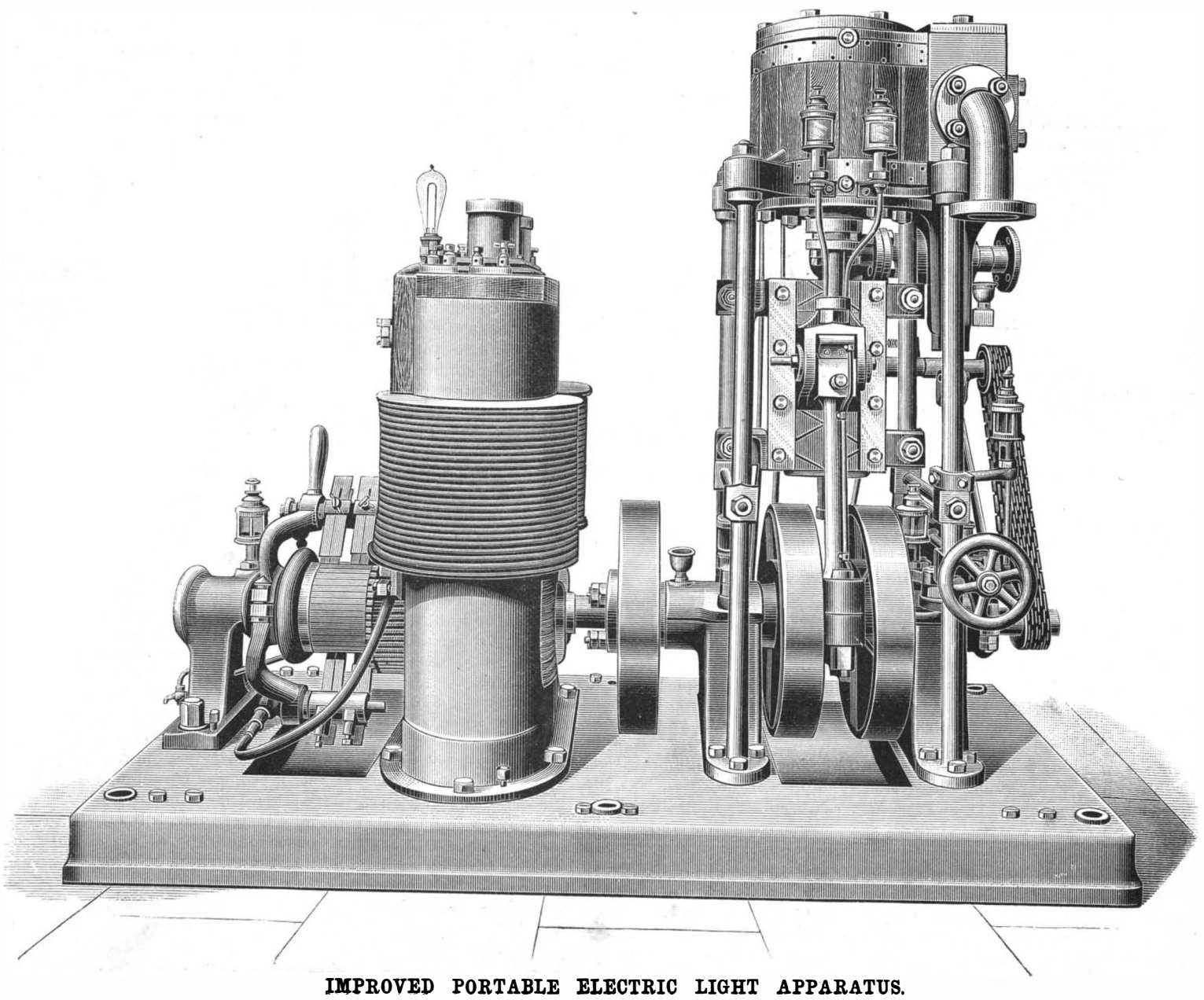


IMPROVED PORTABLE ELECTRIC LIGHT APPARATUS.

The search light projector, which is hung in a cage over the ship's bow, is shown on the first and second engravings. It is of very strong construction, the barrel being of rolled cast steel, with brass rings at the ends, connected together by longitudinal stay bars. It is fitted with best quality Chance mirror and dispersing lens, and has the usual horizontal and vertical movements for directing the beam of light. In order to place the lights under the direct control of the pilot, a switch similar in appearance to an engine room telegraph is provided, to be fixed on the bridge. The electrical connections are made with armored cables, and the necessary instruments and cut-outs are in the same box as the engine and dynamo. The engine, projector, and general arrangement are chiefly the design of Mr. Claude W. Hill, who was engaged for some time on electric light work on the Suez Canal. The apparatus was approved by the Suez Canal Company at the first trial, and Messrs. Charlesworth have further orders in hand.—*The Engineer*.

A New Torpedo Boat.

The Paris correspondent of the *Standard* (London) states that a new torpedo boat for submarine warfare, laid down at Toulon on the 30th of April last year, and built on the plans of M. Zede, a retired French navy constructor, was recently launched, the operation being carried out in the strictest privacy. This new submarine torpedo boat, called the Gymnote, is nearly 60 ft. in length between perpendiculars, and about 6 ft. beam. She is provided with a Krebs electric motor of 50 horse power, and other machinery, the latter to be worked by means of compressed air, and to enable her to emerge or sink as required. Her steering apparatus consists of an ordinary rudder for steering horizontally, and there are other means for steering vertically. Accommodation is provided for one officer, two engineers, and a seaman.



IMPROVED PORTABLE ELECTRIC LIGHT APPARATUS.

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Fires from Steam Pipes.

The second annual report of the fire marshal of the city of Boston for the year ending May 1, 1888, contains, among other matters, the following interesting information:

I have been able to satisfactorily trace the origin of but five fires during the year to steam pipes, and the circumstances surrounding these in no way tend to show that wood in its normal condition, *i. e.*, when free from any previous desiccation, is in danger of becoming ignited in this manner. In other words, ignition in said cases appears to be merely a certain species of what is popularly termed "spontaneous combustion," the steam pipes themselves being merely one of many indirect factors which often assist in producing such combustion. Although the subject has been discussed *pro* and *con* from the year 1846, when Chief Braidwood, of the London Fire Brigade, first addressed the House of Lords on the topic, to the present time, when the opinions of experienced persons interested in the matter seem to be somewhat conflicting, I find by far the preponderance of evidence in favor of the conclusion that wood, subjected for a number of years to the heat of steam pipes, may eventually reach such a state of carbonization as, with the addition of moisture, exposure to a draught of air, or under the influence of friction, caused by expansion and contraction of the pipes, may break into flame. As the ignition point of ordinary pine wood has been determined, by experiment, to be 700° F., it is evident that this must be reduced by some process in order to admit of its taking fire at 292°, the temperature of steam under a pressure of 60 pounds.

I have found one of the most frequent causes of fires, which are directly traceable to steam pipes, to be the self-ignition of dust, fluff, small pieces of paper, waste, etc., which seem especially attracted to the neighborhood of inclosed steam pipes through almost imperceptible crevices. In several such instances the fires have been fortunately discovered and extinguished before doing any harm. P. A. Montgomery, secretary of the Western Manufacturers' Mutual Insurance Company, in special report No. 5 of the Manufacturers' Mutual Insurance Company, refers to this same element of danger, and suggests, as a remedy, the use of a funnel-shaped casting, cast in two parts, from 3 to 6 inches in height, fitting close at the top, and screwed to the floor, where the pipe passes through; and he further recommends that a thimble of some non-combustible material should be put through the hole in the floor or partition and securely fastened on either side, in order to protect the wood from contact with the pipe.

The light sheathing by which the pipes are often covered, being obliged to constantly absorb the confined steam heat, is extremely liable to reach a dangerous ignition temperature. Sheathing reduced to such condition by being in close contact with the pipe, and so placed as to be susceptible to more or less friction, caused one of the five fires herein referred to; another was caused by lumber dust in the dry house of a planing mill sifting through the floor on to the pipes. The desirability of employing some sort of non-combustible covering for steam pipes, to prevent their contact with wood, dust, etc., is apparent. They should never be inclosed in wood sheathing. Professor Gibson, in a report to the Manufacturers' Mutual Insurance Company, gives an exhaustive and instructive treatise on the merits of the various kinds of coverings.

Protect the Boilers and Steam Pipes.

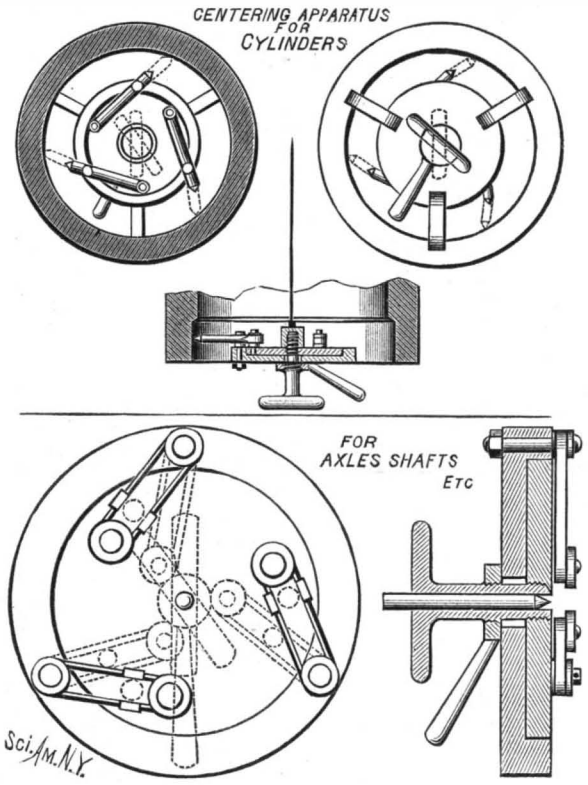
As the edge of cold weather approaches, people in this climate begin to look for suitable winter protection. Heavier clothes are put on, and an overcoat over the outside; houses are banked around, and storm doors and storm windows are put in place. All these things are done for the comfort of the individual and economy of the fuel required to keep the house warm. No one with his senses about him neglects these precautions; but what are we to think of the steam users who will leave the outside of the boiler and the steam pipes exposed to cold currents of air, and suffer a much greater financial loss by the continued condensation of steam? Certainly they cannot be in their right minds, or else they do not appreciate the situation. The loss of heat by radiation varies according to the surface exposed and the difference in temperature between the two bodies. The surface of a steam pipe is very much hotter than the windows and doors of a house, hence for the same area much more heat will be carried away. It is not the loss of the actual number of units of heat in this manner that is the principal objection, but it is the attendant results which cause a much greater loss in other ways. Condensation which takes place in a steam pipe leading to an engine has two serious features about it. In the first place, the condensation carried into the cylinder is likely to cause an accident or break down; and, in the second place, it should be remembered that only about one-tenth of the heat put into the steam is available for producing power, and it is only upon this one-tenth that radiation has any effect; hence, every bit of heat lost by radiation from a steam pipe leading to an engine means the loss of ten times as much heat from the coal pile.

This at first sight may appear astonishing, yet it is, nevertheless, true, and in the case of the commoner kinds of engines more than true, because in them the available part of the heat is often not over one-twentieth of the whole. In such cases it is not uncommon to find nearly one-half of the coal thrown away by allowing boilers and steam pipes to remain unprotected.

It therefore behooves engineers and persons owning steam plants to brick over the boilers and box in the steam pipes; or, better yet, to get a good supply of asbestos covering and apply it liberally. There are thousands of cases where the money spent in this way will all be saved in the coal bill before the winter is half over.—*Wood and Iron.*

AN IMPROVED CENTERING APPARATUS.

An apparatus for centering axles, shafts, cylinders, or other work to be operated on by tools in a lathe or other machine is illustrated herewith, and has been patented by Mr. John E. Howard, of Altoona, Pa. The face plate, as shown in the lower figures, is fitted to rotate within a recess in the outer face of the bed plate, a series of three or four arms pivotally connecting it with the bed plate, the arms being each held by a sliding connection to the head of a pivot block fitted to turn in the face plate, while the arm slips along the pivot block when the face plate is turned in or on the bed plate. The inner ends of the arms may act directly on the article to be centered, or they are provided with anti-friction rollers for such purpose. In



HOWARD'S CENTERING APPARATUS.

the center of the face plate, at the back, is fitted the inner end of a handle, with a handle or jam nut, which, when the face plate is set to cause the jaws to center the work, will be tightened to clamp the face plate and bed plate together, a centering punch in the bore of the handle being driven into the end of the work to mark its exact center. Work of any diameter, from about the diameter of the face plate to a small fraction of an inch, may be centered by this apparatus with facility and exactness. A form of such centering apparatus, more especially designed for getting the center of a cylinder, or in holding a line thereat, is shown in the three upper figures. Here the face plate is arranged for rotation in the recess of the bed plate, but the centering arms, of which there are three, are pivoted at their inner ends to the face plate near its outer margin, the arms being adapted to slide through openings in swivel bolts or blocks fitted to the outer part of the bed plate. The handle has an inner clamp nut or collar in front of the face plate, beyond which is fitted a screw or other end cap having a central hole through which a cord is passed until its end knot stops within the cap. This cord may be run through a steam or other cylinder, as is at times required in constructing or repairing engines or other machines.

Action of Products of Combustion upon Steam Jets.

Herr R. Von Helmoltz has communicated to *Wiedemann's Annalen*, so says the *Journal of Gas Lighting*, some observations made by himself upon a jet of steam. He remarks that a jet of steam escaping from a hole of 1 or 2 mm. diameter, lighted obliquely and observed upon a black background, is invisible at the lower extremity, and presents toward the top the well known whitish appearance. This aspect may be modified in many ways. If an electrified point is brought near the steam, the jet immediately becomes azure blue, or, according to the power of the electrical machine, purple, red, yellow, green, etc. These tints are intimately connected with the dimensions of the liquid drops, and hence it follows that the electrical point has the power of provoking condensation of the supersaturated vapor which is found at the lower part of the jet. The same result is obtained by bringing near to the steam jet a platinum wire made brightly incandescent by an electrical current, or silver, iron, copper, or brass wires simply made red hot in a flame, or even glass heated below the red, or an organic matter, wood, paper, etc., in a state of slow combustion. The products of any flame whatever, with the exception of the flame of pure alcohol, directed upon the jet of steam by the aid of a chimney or by simple blowing, produce a very energetic effect. Finally, traces of certain chemical substances introduced into the steam jet cause the same modification. Among these are hydrochloric and nitric acid, but concentrated sulphuric acid especially shows the phenomenon. It is known that solid dust particles provoke the condensation of supersaturated vapors, but their presence cannot be invoked here to explain the preceding facts.

The author is of opinion that they may be attributed to a molecular concussion, the effect of which may be compared to that of mechanical concussion upon superheated or supersaturated liquids. A flame, for example, is the scene of closely approximated and extremely varied movements, and the chemical atoms which are incessantly passing in it from one combination to another are found in every kind of unstable condition. These movements and changeful states of equilibrium leave their traces in the products of combustion at a certain distance from the flame properly so called, and determine the observed phenomena. The luminous effect produced at the extremity of an electrified point and the presence of ozone in its vicinity show that this point is the cause of concussions comparable to those provoked by active combustion, and the analogy between the two phenomena is found again in the fact that they both furnish means for making electricity pass through gas. As to solid incandescent bodies, they can act either through the emission of solid particles from their surfaces or by the chemical concussions which they communicate to the surrounding gases.

One Million Dollar Telescope.

The chances are that the moon will be as well known to the inhabitants of the civilized world as the interior of Africa is at the present time. The telescope manufactured by order of the late millionaire Lick for the university known by his name in California has enjoyed the distinction of being the largest and strongest in the world, but it is likely to undergo a comparative eclipse. Mr. Abram Clark, who made it, has undertaken the task of making one yet larger and more powerful. Should he succeed, as he is perfectly confident that he will, valuable additions may be expected to be made to our knowledge of the worlds by which we are surrounded. In a recent talk on the subject Mr. Clark disclosed some facts quite contrary to general belief in regard to astronomy. It has been popularly supposed that we had reached the maximum of effective telescopes.

The big ones, the leading astronomers told us, disclose little of the heavens' wonders. And they pointed out that the most important discoveries of the present century had been made by telescopes of a medium size. Hence the deduction that it was useless to bother with larger lenses. Such a theory, of course, gave us little of practical value to hope for from astronomy. With the telescopes now in use we could expect to determine more accurately the distance from the earth to the sun, or to lay bare more stars. But in discoveries of this kind the great mass of humanity could scarcely be expected to take any very great interest. It was the verdict of most of the professionals that the Lick telescope would be a failure, so far as adding anything to practical knowledge of the heavenly spheres was concerned, but in this, as in many other instances, they were mistaken. It has already been demonstrated that, properly constructed and located, a big telescope is more effective than one of smaller size. It has been shown, in fact, that there is practically no limit to the power of a telescope, and that if a sufficiently powerful one can be made, we can bring most of the planets near enough to examine their every nook and corner.

The lens of the new instrument for the university at Los Angeles is to be 40 inches diameter, and Mr. Clark claims that he is able to make one five feet in diameter—one which will bring the moon within a few thousand feet of the earth. It is simply a question of time and money—mainly money, as a telescope with a five foot lens, properly mounted, would cost a million dollars. If Mr. Clark's position is true, and there is every reason to believe that it is, astronomy, a science which has been practically at a stand for years, will take giant strides. There will be practically no limit to the discoveries it can make, and there should come from it some practical benefits. Each year we will know more of the heavens, and of all sciences astronomy will be changed from the slowest to the most progressive.—*Mail and Express.*

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THE SING SING ANTELOPE AND THE GORGON ANTELOPE.

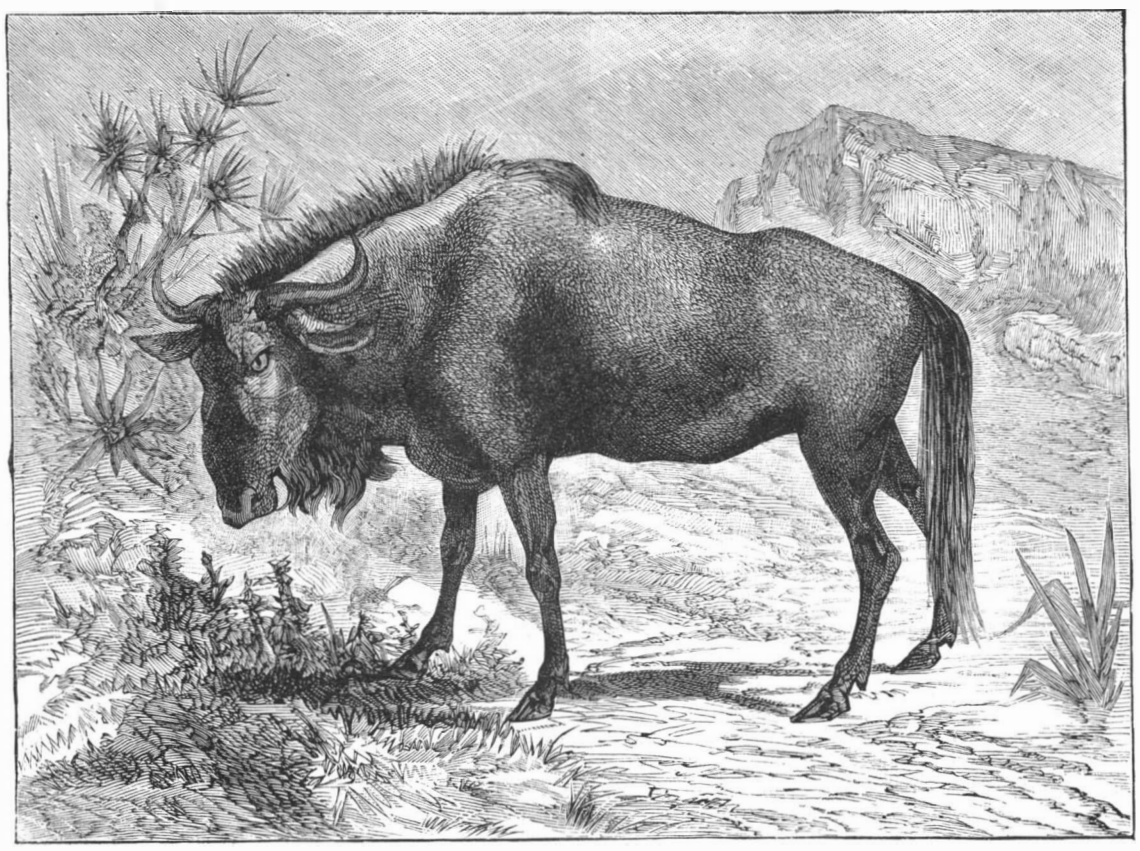
People visiting the menagerie of the museum at Paris hardly are aware of the wealth which is accumulated in that place. Not to mention those animals which obstinately hide from view in their sheds during the greater part of the day, there are many species of which only an imperfect view can be obtained or which are not seen to their advantage, being penned up in too narrow inclosures, the fences of which consist of wooden latticework, hiding the animals from the eye of the visitor. With these faults in the arrangement, however, it must be acknowledged the present directors cannot fairly be charged, for, having only limited means at their disposal, they cannot think of a radical transformation, and must restrict themselves to the introduction of some gradual improvements in the old menagerie of Cuvier and Geoffroy Saint Hilaire. Nevertheless, the existing state of things is greatly to be deplored, because it prevents people from justly appreciating the value of a large number of mammals, as well as birds, which are interesting as regards their manners as well as their shapes. It is certain, for instance, that the antelopes would produce a much better effect if they were permitted to ramble over vast meadows, interspersed with shrubs and bushes, for then only the magnificent Kob antelopes, a herd of which is in the possession of the museum, and which are the offspring of one male and two females given to the institution by M. Briere de l'Isle, who at the time was governor of Senegal, would be appreciated as they deserve to be.

These Kob antelopes, as shown in the engravings accompanying this article, have a robust but elegant form. Their heads are surmounted by pointed horns, diverging in the shape of the arms of a lyre, slightly bent inward at their ends, and marked with rings at three-quarters of their length. Their necks are clothed with a sort of mane. The hair of the body, though not as long as that of the head region, is, nevertheless, longer than that of many other antelopes, and is always impregnated with a greasy substance. This peculiarity has already been pointed out by Laurillard, who proposed to name the above mentioned animal *Antilope unctuosa*, or greasy antelope. The general color of the coat is a light chestnut, changing to a yellowish white toward the posterior region of the body and the inside of the limbs, and grayish white on the throat and cheeks, while the extremities of the limbs are of a deep brown. The comparatively slender tail ends in a tuft of black hair. The ears are bordered with black on the outside, and lined inside with long white hairs, and white stripes or spots are seen near the hoofs, above the eyes, and upon the upper lip and the chin.

The Kob antelope of Senegambia is scientifically called *Kobus sing sing*. According to M. De Rochebrune, it is quite common in Cayor and the Upper Senegal, and, according to M. Gray, on the banks of the Gambia—*i. e.*, in the tropical region. Nevertheless, the specimens which were brought over to our country seem not to really suffer from the severity of our winters. In the Jardin des Plantes they spend the greater part of their life in the open air, and have no other refuge than an unheated shed. Far, however, from suffering under these conditions, they thrive admirably, and reproduce quite as well as they do in their native country. In fact, the information given by M. Huet to the Society of Acclimatisation* shows that since 1880 not less than six Kob antelopes have been born in the menagerie of the museum. It is therefore probable that this species of antelopes would become acclimated without difficulty on the banks of the great rivers of Central France, and especially in Touraine.

As many species of mammals and birds are spread over the whole of the African continent, one might be led to believe that the antelope discovered in Abyssinia by Ruppell, and called by that naturalist *Antilopas defassa*, ought to be classified along with the Kob antelope of Senegal. Nevertheless, M. J. Murie has pointed out* that two antelope skins which were brought to Europe twenty years ago from the Upper Nile by Baron Guillaume De Harnier, and kept in the Grand Ducal Museum of Hesse-Darmstadt, possess neither the greasiness nor the long and tufted hair of the Kobus sing sing. Besides, their coat has less of a reddish and more of a brownish color than that of the Kob antelope of the Senegal, and these differences in the nature and the color of the hair seem not entirely to be caused by the season, for one of the two antelopes referred to was shot during the rainy season, while the other one was killed during the dry season. Nevertheless, the hair of both is shorter and darker than that of the Kob antelopes of the Senegal which are kept in the Zoological Garden of Antwerp,†

THE SING SING ANTELOPE.



THE GORGON ANTELOPE.

* *Bulletin* of the Societe d'Acclimatisation, 1887, No. 5, p. 272.

*Note published in the Proceedings of the Zoological Society of London, in 1867.

† In consequence of these differences the antelope of the Upper Nile has been named by Kaup *Antilope Harnieri*.

and in the Jardin des Plantes in Paris. The horns, however, have the same position as those of the sing sing antelope, and the same characteristics are found in the head of an antelope brought from Uganda by Captain Speke, and belonging undoubtedly to a species of antelopes called by that traveler *Antilope N'samma.** Finally, also, the *Mehedehet antelope*, shot by Sir Samuel Baker on the banks of the Asua, at longitude 3° 12′ west of Greenwich, resembles the Kobus sing sing.

On the vast plains of Eastern Africa lives another species of the Kob antelope of shorter stature, which is called *Kobus ellipsiprymnus*, the Kobus with the crescent, on account of a white band which runs down from the *os sacrum*, terminating in a point upon either thigh. The coat of this antelope is of a yellowish gray color, changing to a reddish brown upon the forehead and the chanfrin, and to white upon the throat, the muzzle, and above the eyes. These antelopes, just as others of their kind, chiefly like the neighborhood of rivers, and browse on tender herbs and aquatic plants. They form small herds consisting of several females, two or three young males, and one adult male, who watches over the welfare of all. As soon as he espies some danger, he starts off at a gallop and the whole herd follows his heels. On such an occasion, these animals, which have usually a somewhat heavy appearance, are seen in all their beauty, covering, with a surprising swiftness, vast spaces of territory, until they find some swamps or a river, into which they plunge without hesitation, and in this manner, it is said, they escape the lion, their most terrible enemy. In Eastern Africa the natives do not hunt this kind of antelope, as its flesh has a very distinct goat odor.

The gorgon antelope (*Antilope gorgone* or *Catoblepas gorgone*), which also inhabits the south of the African continent, and a specimen of which may be seen in one of the inclosures of the Jardin des Plantes, differs so essentially from the Kob antelopes, the nilgauts, and the gazelles, and also from most other antelopes, that, at first sight, it is difficult to understand why naturalists should have classified it along with them under the same family name, together with the gnu, its nearest relation. Nevertheless, on closer observation, several of the essential characteristics of the *Antilopides* are found in these two odd animals, which have the head and neck of a bull and the rump and tail of a horse (Fig. 2). In an article on antelopes in general† we have spoken already of the common gnu or Sparman's gnu (*Catoblepas gnu*), and we have shortly described the species, as well as some of the habits of that animal, according to the statements made by different travelers, and checked by observations in the menagerie of the museum. It would therefore be unnecessary to recall in this place that great antelope of Eastern Africa, were it not to mention two facts which prove his aptitude of living and producing offspring under the climate of Western Europe. The Jardin des Plantes is in possession of a female gnu born in captivity, and M. Blauw has also succeeded, even under the gloomy sky of Holland, in obtaining a young one from two gnus which he keeps in a deer park. These young ones, during the first part of their existence, had no horns, and the color of their coat was reddish gray, but gradually they have obtained the coat and the distinctive signs of the adult gnu. Their horns, after first having grown in a vertical direction, by and by curved into two diverging hooks, and at the same time increased at the base so as to form a shield on top of the head. This shield does not exist in the gorgon antelope, whose horns, although very thick at the time of birth, remain separate and curve outward, bending inward only at their ends, nor does this antelope possess any trace of the tuft of black hair which is found upon the

* Vide Speke, Journal of the Discovery of the Source of the Nile, 1863, p. 471, and also Ph. Sclater's note in the Proceedings of the Zoological Society of London, 1864, p. 102.

† Vide *La Nature* No. 291, Dec. 28, 1878, p. 49; No. 294, Jan. 18, 1879, p. 98; and No. 297, Feb. 8, 1879, p. 146.

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middle of the nose of the gnu, but like the latter it has a real beard grown out from its chin and falling down upon the throat, and the top of the neck bears a rough mane extending to the withers. The coat of the gorgon antelope has a different color from that of the gnu antelope, being of an iron gray running into a reddish brown on the lower parts of the body. There appear to be vertical stripes upon the neck and the flanks; but these stripes, which are not very noticeable, are not the result of a different color, as in the coat of the zebra or the tiger, but are produced merely by the position of the hair, which diverges, and the ends of which seem arranged in regular parallel lines. The mane as well as the tail of the gorgon antelope is, like that of Sparman's gnu, deeply shaded with black, and the hair of the tail touches the ground.

According to Dr. Kirk, a well known explorer, the gorgon antelope is called *kokong* by the Betchuanas and *nyumbo* by the Manganjas and the tribes which live on the banks of the Zambese. The English colonists (?) commonly call it the "blue wild beast." It is very common in that whole region of Eastern Africa, especially in the country of the Batokas and on the banks of the Shirwa, where it is found in numerous bands when it does not join the zebras which it accompanies in their ramblings. It is also found in Zululand and in the West, in Damaraland, but it does not pass the borders of Cape Colony in the south. The natives hunt it very actively, less for its meat, which is tough and has a disagreeable taste, than for its skin, parts of which are in great demand. The tail of the gorgon antelope in fact is, in the eyes of the natives, a wonderful talisman, and able to procure success in warlike expeditions.

Toward the middle of November the males of this species of antelope separate from their herds and roam around the country, always ready to pick a quarrel with other males whom they meet on their way. When they are suddenly surprised, they usually run once or twice in a large circle before taking to flight.—*E. Oustalet in La Nature.*

Launch of the City of Paris.

On the afternoon of Tuesday, October 23, the second of the Inman and International Company's steel twin screw steamers, which have been built by Messrs. J. & G. Thomson, was successfully launched from the premises of that firm at Clydebank, near Glasgow. This vessel, named the City of Paris, is a sister of the City of New York, which was completed by the same builders about four months ago, and has since made five single runs across the Atlantic. The City of New York, at the completion of her experimental run around Ireland from the Clyde to Liverpool, was fully described in our columns, and it now only remains to remind our readers that the principal dimensions of the two vessels are as follows:

Length over all, 580 ft.; length on water line, 525 ft.; breadth, extreme, 63¼ ft.; and depth, moulded, 42 ft.; the gross registered tonnage being 10,500 tons. The vessels have very fine and graceful lines, and their beautiful appearance is in nowise impaired by the clipper bows with which they are provided. Each ship is propelled by two sets of triple expansion engines, and, as already remarked, they are supplied with twin screws, so that if one engine or propeller should become disabled, they can proceed with the aid of the other. This provision has more than once already been found of great value during the runs of the City of New York, the performances of that vessel not having been, so far, quite so successful or free from mishap as could be desired. It does not appear, however, that the failure to develop the contemplated speed is much, if at all, due to any shortcomings as regards the design and construction of the hull, it being almost impossible to conceive a form of body better calculated for the attainment of a high velocity through the water than that of the City of Paris and her sister. If there is any imperfection in the construction, in so far as contribution to fluid resistance is concerned, it is perhaps in the arrangement of double butt straps. Valuable as these double straps are as a source of longitudinal strength and of stiffness at the butt joints, it is yet to be feared that so many projections on the surface of the plating must be productive of an augmented skin frictional resistance, which may even exceed the highest value that has hitherto been assigned to it. We are not aware that the builders have made any allowance at all on this score, but certain it is that it is much too considerable to be wholly ignored. One of the most noticeable features in the design is the extent to which the principle of bulkhead subdivision has been carried. This alone should be sufficient to make the vessels highly popular in the Atlantic trade; for much as one may value the advantages of a speedy passage, yet it is of far more importance that a passenger steamer should be safe against the consequences of collision or other such disaster than it is to be able to save a few hours' time in making the run from port to port. The twin screw system of propulsion contributes materially to the attainment of this source of safety, as it enables longitudinal as well as transverse bulkheads to be fitted in the spaces which under ordinary circumstances would hold a large volume of water. Hence, with a hole in one side of the machinery or boiler spaces, the vessel would still remain afloat, and be capable of steaming at a reduced speed. It has been anticipated that these qualities, combined with a very high rate of speed, will attract large numbers of passengers to the two ships, and consequently accommodation has been provided in each for upward of 2,000 persons.

As might be expected, the launching of so large and handsome a vessel attracted thousands of visitors to Clydebank. The most complete and careful arrangements had evidently been made to secure the safe flotation of the ship, and the whole of the details in connection with the same were carried out in the quietest and most skillfully organized manner. It is no simple task to slide such a monster into the water, and this fact seems to have been keenly appreciated by the builders. Three dog shores were placed on each side of the bow, and these were knocked down in pairs at a time, but ere the foremost pair were struck the vessel was lively, and even slowly in motion. The duty of christening was performed by the Hon. Lady Campbell, of Blytheswood, and the launch was in all respects successful.

The company invited, to the number of about two hundred, then adjourned to the large model room of the firm, where a very sumptuous repast was provided. The toast list which followed was short, so as to enable the party to return to Glasgow by a special train in waiting. The chair was occupied by Mr. George Thomson, Mr. James Thomson being at present in the United States, having accompanied the City of New York thither on her last trip. In proposing the toast of "The City of Paris and the Inman and International Steamship Company," Mr. Thomson said that the vessel just put into the water, like her sister, the City of New York, would, he hoped, prove a favorite among those crossing the Atlantic ferry. He was quite sure, and the City of New York had demonstrated the fact, that as regards seaworthiness, and all that pertains to the safety and comfort of passengers, these vessels were all that could be desired; and there was nothing wanting in those respects.

Mr. Taylor, of the Inman and International Steamship Company, in responding to the toast, said he would remind those who expected the City of New York to develop at once her highest speed, that the attempt to do such a thing would altogether spoil every chance of attaining the object her owners had in view, viz., that of making her an ultimate success. Some writers in the press appear very impatient because the ship has not so far done all they thought she would do. He was sorry they had made such a mistake. Some of them thought she would at once start off and beat the best performance of the Umbria, but he would remind these people that the Umbria and her sisters are improving all the time, and that they did not at first develop the speed of which they are now capable. The owners of the ships have received every assistance from the builders in their efforts to remove all hindrances to success. They hoped soon to satisfy their customers by fast steaming; for as the vessels are intended chiefly for passengers, if they do not succeed in attracting passengers, they must inevitably be financial failures. Advantage has been taken of their experience with the City of New York, and some trifling details in the City of Paris have been amended. This is the second vessel of the same name which has been built for the Inman Company.

Notwithstanding Mr. Taylor's references to other Atlantic steamers, and the gradual improvement in their speeds since they made their first voyages, there will be many, says the *Engineer*, who will still think that the City of New York might reasonably have been expected to show better results than were attained in her earliest runs. The trial trip speeds of most steam vessels exceed those of their after working life, so much so that the subject has become one of jeering comment; it being alleged that the conditions of the trial are generally so favorable as not to afford a fair criterion of actual work. It would seem, however, that the earliest trials are really made under difficulties, and that the forcing of the new machinery to its highest capabilities is attended with risk. This is, no doubt, to some extent the case; but yet the risk is commonly faced, and the maker of the engines is content to abide by the results so obtained. It is difficult to understand in what respects the conditions under which the engines of the City of New York have been so far tried differ from those existing in other newly built steam vessels, and most people will conclude, however rashly, that her performances have been disappointing. Our own impression is that the ship is short of steam; she has, be it remembered, only fifty-four furnaces, as against the seventy-two furnaces of the Etruria. The City of New York has now nine boilers; if a tenth were added, the additional six furnaces would supply just that which she now seems to lack, and there is no good reason why this boiler should not be given her. The enterprise of the owners and the skill of the builders are beyond question, and hence the perplexity which has arisen. Great things were very reasonably expected of the two ships; for why should so much money have been spent, and such skillful service secured, unless the "Atlantic record" was to be beaten? We heartily trust that all difficulties will soon be surmounted, and that the two magnificent vessels now added to the Inman and International fleet will prove to be a great advance in the solution of the problem of swift, safe, and comfortable ocean navigation.

A New Rocket Signal.

A new signal has recently been brought out by the Cotton Powder Company, of Queen Victoria Street, London. The distinguishing features of this invention, says *Engineering*, are that no stick is required, and there is no back fire. The rocket takes the form of a metal cylinder, in the base of which is the propelling charge. Above this is a charge of tonite, and above this again a star composition. The rocket is placed in a phosphor-bronze socket, which may be screwed or let into the rail of the ship. When it is required to fire it, a firing tube is placed in the center of the rocket and to the top of this a lanyard is hooked. The propelling charge is fired by simply pulling the lanyard, and the signal is propelled upward at one impulse. The wire fuse by which the detonating charge is exploded is at the same time ignited, and this burns until the rocket has reached the maximum height, which is 600 ft. The stars are thrown out, giving a brilliant illumination, and the tonite charge then explodes. The noise of the explosion is equal to the firing of a six pounder gun, but being high, is heard at a great distance; indeed, in one instance a disabled vessel brought another to her assistance from a distance of 12 miles. These rockets are so portable and easy to fire—no match or portfire being required—that they are very suitable for boats, and doubtless many lives would have been saved had they been in use in cases where shipwrecked crews have had to take to the boats. The Board of Trade have authorized their surveyors to pass these rocket distress signals in lieu of both guns and rockets, so that many lines of steamships have landed their guns and use these signals instead. The National Lifeboat Institution are also introducing them with red stars, which is the distinctive signal to summon a lifeboat crew. A further advantage in this form of rocket is that a combination of colors and number of stars can be so arranged as to form a code on the principle of the Morse alphabet, a feature which may prove of great importance in naval maneuvers and for torpedo boat operations. The full sized rockets are 7 in. long and 2 in. in diameter. A smaller size, which is called the "rocket light signal," is also made. This has no explosive charge. Another modification of the idea consists of a sound signal, which has no stars. This takes the place of a gun.

The Galapagos.

Prof. Leslie A. Lee speaks as follows concerning the recent visit of the Fish Commission steamer Albatross to the Galapagos Islands:

The islands presented a very inhospitable look along the shores, with the black lava cropping out everywhere; but in two of them (Chatham Island and Charles Island) the interior was extremely fertile and pleasant. Collecting was always difficult; but, with the co-operation of officers and men, we obtained a great quantity of material. We naturally looked to the birds first, on account of Darwin's previous work there. We have over 250 good bird skins, besides several hundred specimens in alcohol and a few skeletons. Of the fifty-seven species before reported from there, we obtained examples of fifty or more, and we have, in addition, several which are apparently new to science. We hope, with our material, to settle some of the curious problems of these islands.

We secured specimens of all the reptiles which have been before found there, and also hope that we have two or three new lizards. The tortoises excited great interest, and it would please you to see the many large ones which are now crawling about our decks. We expect now that we shall be able to raise them in the States.

Fishing was good at all of our anchorages, and we all had sport in catching fishes over the ship's side. We got between thirty and forty species in all, including a large brown "grouper," which is there caught and salted for the Ecuador market.

One night, while running from one island to another, we stopped and drifted for a while, and put the electric light over the side. Besides many small things, large sharks came around in great numbers. More than twenty were seen at once.

A Venerable Toad.

Local antiquarians and zoologists are enchanted at present with a live toad found in the course of railway excavations at Greenock, Scotland. The toad is from 20,000 to 30,000 years old, as the stratum of clay in which it was found certainly dates from the glacial period. Its mouth is sealed up. It breathes slightly through the nostrils, and though the eyes are quite expressive, it does not seem to see.

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ENGINEERING INVENTIONS.

A railroad rail fastener has been patented by Mr. Charles Netter, of New York City. It consists essentially of a clamp plate formed with a recess in one edge, in combination with a keeper of novel form having enlarged lower end and inclined side recesses, for fastening the rails to metallic or other ties.

A rotary engine has been patented by Mr. James I. Friar, of Pascagoula, Miss. It is made with a cylinder having a concentric longitudinal opening and a cam held on such opening at each side of the cylinder, in combination with a piston traveling in the opening, and gates adapted to slide radially in the piston and carrying friction rollers traveling on the cam.

A car coupling has been patented by Mr. Thomas J. Eddleman, of Fort Worth, Texas. The link has a lateral hook and vertical perforation, while a laterally swinging gate extends part way across the mouth of the drawhead, the invention also covering other novel features, whereby the car may be uncoupled from the sides, and a car provided with this coupling may be coupled to one having the ordinary link and pin coupling.

MISCELLANEOUS INVENTIONS.

A portable house has been patented by Mr. Drummond Welburn, of Orlando, Fla. The invention covers novel features of construction and combinations of parts, the principles of which may be employed in building two-story houses, or in the building of outhouses and houses for birds and beasts.

A thill coupling has been patented by Messrs. Enoch F. Drake and Alfred C. Wait, of Salina, Kansas. This invention covers a novel construction and combination of parts designed to overcome all rattling, and to effectively and securely hold the thill or pole against accidental displacement or detachment.

A water wheel has been patented by Mr. Selden B. Lard, of Waterville, Kansas. It is made with a series of overlapping leaves or buckets pivoted a little at one side of their center, and with a series of loosely pivoted and sliding catches for engaging the leaves or buckets when folded, to lock them closed.

A hand truck has been patented by Messrs. Wiltshire Sanders and John B. Rafferty, of Reno, Nevada. It is especially designed for handling large boxes and baggage, having a frame located intermediately between the wheels, with a roller having projecting handles supported to turn freely in bearings.

A fire escape has been patented by Mr. Louis P. Santy, of Clements, Kansas. This invention consists principally of three systems of lazy tongs connected together and arranged to be elevated and lowered by a screw mounted in the platform of a truck, to which the device is adapted to be attached for use in streets.

A wrench has been patented by Mr. Joseph G. Hoffman, of Ste. Genevieve, Mo. This invention relates to a socket wrench, the jaws of which are designed to safely withstand torsional strains, and be readily locked to fit nuts or other articles of any given size, or be made self-adjusting to fit articles of various sizes.

A velocipede has been patented by Mr. Francis M. Wolf, of Springfield, Mo. It has two large drive wheels and two small wheels adjusted to a frame of novel construction, being designed as a simple and inexpensive vehicle with which a high rate of speed may be attained on ordinary roads, and which may be readily steered and controlled.

A shoe clasp has been patented by Mr. Herbert S. Pullman, of Rockville, Conn. It is especially adapted for use with arctic overshoes, the object of the invention being to economize in metal and produce a simple, easily manipulated tongue adapted for use in connection with the ordinary form of keeper and in essentially the ordinary manner.

A stove pipe drum has been patented by Mr. Mark J. Liddell, of South Englewood, Ill. It is made with an outer cylinder, an intermediate cylinder, and an inner draught pipe, the latter having near its lower end an opening and a damper, the device being adapted to facilitate the radiation of heat passing through a draught pipe from a stove or heater.

A washing machine has been patented by Mr. Jacob L. Martin, of Leo, Ind. The machine is of that class in which one washboard is reciprocated with its face in proximity with the face of another washboard, to secure durability and easy operation of the machine, and holding the articles to be washed to the action of the washboards.

A well boring apparatus has been patented by Mr. Benjamin Andrews, of New Orleans, La. Combined with a non-rotating well tube is a boring head which rotates on the lower end of the tube, and a tube working within the latter and detachably connected with the boring head, so that it may be utilized for rotating the latter, with other novel features.

A shutter worker has been patented by Mr. Franklin W. Kelly, of Vermontville, Mich. This invention covers certain novel combinations of parts and details of construction to prevent the outside gearing from becoming clogged or injured by rain, ice, or snow, to provide for the ready detachability of parts, and to render the clutch mechanism safer to work and more durable.

A line holder for bricklayers has been patented by Mr. Julius C. A. Vogelsong, of Ardmore, Pa. It consists of a flat pin with a shoulder to engage the corner of a wall, a bearer to rest upon the face of the wall, a recess at the inner end of the shoulder, a handle, and guide holes for the line, by which a gauge line may be readily applied when either a corner or flat surface is available.

A mast hoop has been patented by Mr. Charles S. Mott, of Patchogue, N. Y. It is of that description in which two separate sections are hinged to each other and provided with a spring catch for locking them together, the object of the invention being to simplify, strengthen, and improve the construction both of the hinge joint and the locking and unlocking joint.

A knockdown box has been patented by Mr. Casbar G. Krikorian, of Smyrna, Turkey. It is preferably made of wood, with sides and ends so hinged to a bottom piece that when thrown up at right angles they will rest on the upper face of the bottom piece, the invention also covering other novel features in the construction of a box specially designed for transporting fruit, etc.

A combined scarf tip and fastener has been patented by Anna L. Seibert, of New York City. Its body has a toothed tongue and a slide, and is also provided with an opening for the reception of a scarf band and a spur for engaging the band, the device effecting a saving of cloth and dispensing with the use of the ordinary pin for engaging the neck band to the shield.

A case for surgical or other instruments has been patented by Mr. William R. Leonard, of New York City. Combined with the bed of the case are sockets or clamps pivoted to the bed to move laterally, and hinged to swing vertically, with other novel features, whereby an instrument may be conveniently and expeditiously extracted or replaced without the fingers coming in contact with the blade.

A music box has been patented by Mr. Emile Bornand, of Ste. Croix, Switzerland. The main spring case has a gear wheel meshing into the pinion of the wind wheel, and a second gear wheel meshing into a pinion on the cylinder shaft, there being also other novel features, by which the cylinders can be easily and accurately placed in position in the box and quickly interchanged.

A ventilator has been patented by Messrs. George and David Lemley, of New Orleans, La. The body has an open upper end, above which is held a conical cap, a series of circumferentially arranged bell-mouthed pipes projecting through the body below the top, and having inclined and converging inner ends, the construction being designed to create an upward draught capable of counteracting any draught having a downward tendency.

Two kinds of plastering composition form the subject of two patents issued to Mr. John H. Fitzgerald, of Frankford, West Va. That to be used for the first coat consists of sand, sawdust, plaster of Paris, slaked lime, sugar, and carbonate of soda, while that for the second coat is made of cream of tartar, pumice stone, sugar, lime, and plaster of Paris, each composition being compounded and applied in proportions and after a manner described.

A double acting force pump has been patented by Mr. Winfield S. Shahan, of Russell, Kansas. At the upper ends of side standards a lever is fulcrumed to which the plungers are pivoted, so that by operating the single lever both plungers are alternately raised and lowered, the lower end of each plunger having a flexible packing formed with a concave cup at its lower surface, so that the pressure of the water in the cup will expand its lower edge and thus automatically pack the plunger.

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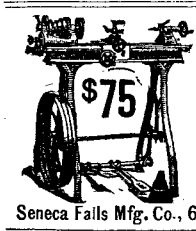

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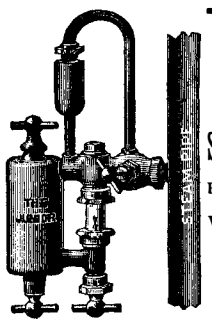

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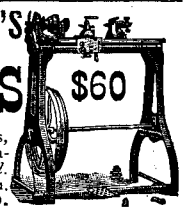

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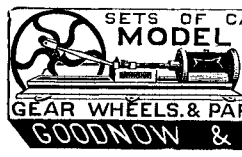

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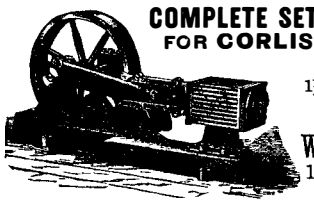

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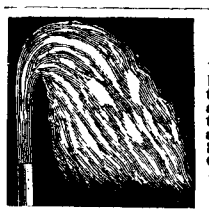

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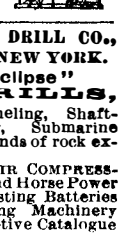

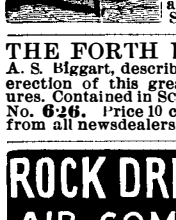

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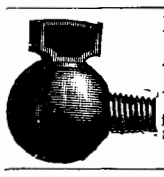

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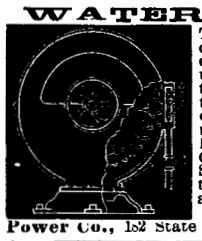

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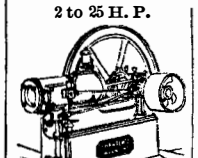

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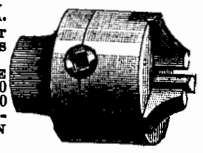

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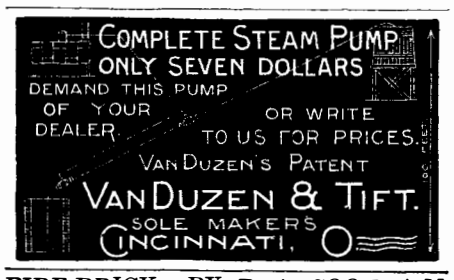

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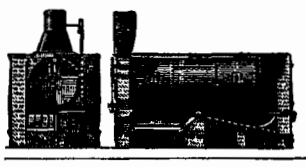

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Dredging at Wilson's Point, Norwalk Harbor, Conn.—ENGINEER OFFICE, U. S. ARMY, Room 57, Army Building, cor. Houston and Greene Streets, New York, *November* 13, 1888.—Sealed proposals in triplicate for dredging at Wilson's Point, Norwalk Harbor, Conn., will be received at this office until twelve (12) o'clock M. on Thursday, December 13, 1888. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Further information, specifications, and forms of proposals can be obtained at this office.
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Breakwater at New Haven, Conn.—ENGINEER OFFICE, U. S. ARMY, Room 57, Army Building, cor. Houston and Greene Streets, New York, *November* 13, 1888.—Sealed proposals in triplicate for breakwater at New Haven, Conn., will be received at this office until twelve (12) o'clock M. on Thursday, December 13, 1888. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Further information, specifications, and forms of proposals can be obtained at this office.
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Dredging in Five Mile River Harbor, Conn.—ENGINEER OFFICE, U. S. ARMY, Room 57, Army Building, cor. Houston and Greene Streets, New York, *November* 13, 1888.—Sealed proposals in triplicate for Dredging in Five Mile River Harbor, Conn., will be received at this office until twelve (12) o'clock M., on Thursday, December 13, 1888. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Further information, specifications, and forms of proposals can be obtained at this office.
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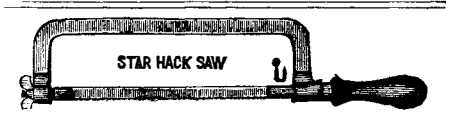

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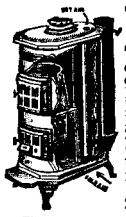

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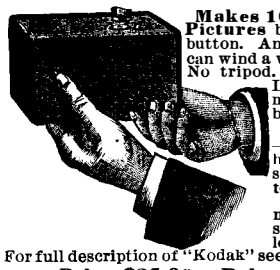

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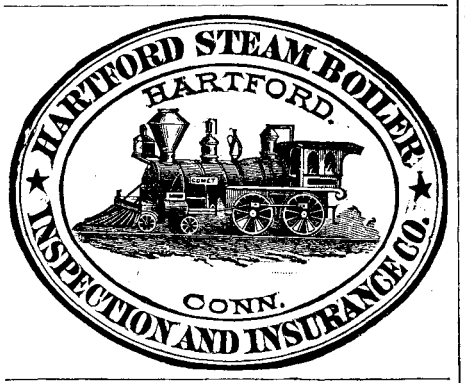

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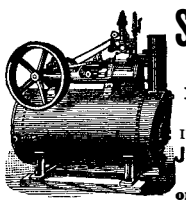

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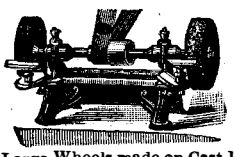

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